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ABSTRACT

Serving as a bridge between research in the cognitive sciences and educational policymakers and practitioners, the first part of this report reviews recent research on thinking and learning. Findings emphasize work on higher order learning, the role of knowledge in learning, and the development of a disposition for thinking. Topics detailed include higher order processes, cognitive frameworks, cognitive styles and intelligences, transfer of skills, metacognition, and knowledge in learning. Subject-specific skills in language, mathematics, science, and social studies are examined. Two sections provide discussions about: (1) what the teacher's role should be in supporting higher order learning for all students; and (2) student assessment that supports thinking. Examples are provided of specific programs whose stated purpose is to teach thinking. The second part of the report notes the findings of a national, state-by-state survey on critical thinking initiated during spring 1990. Survey design and methodology, response, findings, and conclusions are detailed. Appended is a policy statement on restructuring learning for students. Also appended is a systematic description of promising state programs, in state-by-state charts, for general and special needs students. Information includes a summary, information on funding, the impetus, the goals, the implementation strategy, and whether the program targets middle grades. (69 references) (RR)

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Higher Order Learning for All

A
Report
by the
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on
Restructuring
Learning

November 1990

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The Council of Chief State School Officers (CCSSO)

The Council of Chief State School Officers (CCSSO) is a nationwide nonprofit organization of the 57 public officials who head departments of public education in every state, the District of Columbia, the Department of Defense Dependents Schools, and five extra-state jurisdictions. CCSSO seeks its members' consensus on major education issues and expresses their views to civic and professional organizations, to federal agencies, to Congress, and to the public. Through its structure of committees and task forces, the Council responds to a broad range of concerns about education and provides leadership on major education issues.

Because the Council represents the chief education administrator, it has access to the educational and governmental establishment in each state and to the national influence that accompanies this unique position. CCSSO forms coalitions with many other education organizations and is able to provide leadership for a variety of policy concerns that affect elementary and secondary education. Thus, CCSSO members are able to act cooperatively on matters vital to the education of America's young people.

The CCSSO Resource Center on Educational Equity provides services designed to achieve equity in education for minorities, women and girls, and for disabled, limited English proficient, and low-income students. The Center is responsible for managing and staffing a variety of CCSSO leadership initiatives to provide better educational services to children and youth at risk to school success.

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A. Acknowledgements

The Council of Chief State School Officers (CCSSO) for the past four years has placed the educational success of disadvantaged students at the center of its work. In 1989 the Council, as a major initiative, examined proposals and projects to restructure schools in order to improve the learning of students, particularly those students placed at greatest risk.

As a logical extension of the Council's work on school restructuring, throughout 1990 CCSSO examined a wide array of work related to improving thinking and reasoning for *all* students, especially those students placed at risk of school failure. The Council reviewed recent research in cognition and learning and how those findings can serve to improve instruction.

In November, 1990 at its Annual Meeting the Council adopted a forceful statement delineating principles and strategies to guide education policymakers in the effort to improve the teaching of thinking for all students. At the same meeting the Council approved this report. Several people are responsible for the research, writing and final release of the report on restructuring learning. The CCSSO Task Force on School Restructuring, co-chaired by Eve M. Bither, Maine Commissioner of Education and Robert E. Bartman, Missouri Commissioner of Education, was responsible for directing the Council's work on restructuring learning.

The members of the Task Force on School Restructuring included: John Brock (Kentucky), Donald Carroll (Pennsylvania), Linda Creque (Virgin Islands), Bob Etheridge (North Carolina), Andrew Jenkins, III (District of Columbia), Robert Leininger (Illinois), Harold Raynolds, Jr. (Massachusetts), Wayne Sanstead (North Dakota), Joseph Shilling (Maryland), Thomas Sobol (New York), Joseph Spagnolo (Virginia), Anita Sukola (Guam), Jay Taggart (Utah), and Charles Toguchi (Hawaii). The Council is indebted to the members of the Task Force for the leadership they provided throughout the year. Gordon M. Ambach, Executive Director of the Council, guided the development of the several Council initiatives and publications focused on higher order learning for all.

The efforts of the Task Force on School Restructuring were supported by the staff of the Council's Resource Center on Educational Equity, directed by Cynthia G. Brown. Christopher M. Harris, Senior Project Associate at the Resource Center on Educational Equity authored Part I of this report, An Education of Thinking and Reasoning for All Students, and was the principal drafter of the policy statement on restructuring learning. Project Associate Leslie Talbot oversaw the survey of states and was responsible for Part II of the report which describes state initiatives to support critical thinking. Jomills H. Braddock, II and Joyce Epstein of the Center for Research on Effective Schooling at Johns Hopkins University assisted in the development of the survey. Ramsay Selden, Director of the Council's State Education Assessment Center and Tommie Williams, the Council's Manager of Administrative and Member Services, provided important technical assistance. Lorena Aranda, Daniel Leibert, and Ellen Cohen helped compile survey data. Barbara West, Administrative Assistant, and Reaksia Banks, Secretary, in the Resource Center prepared the report for publication.

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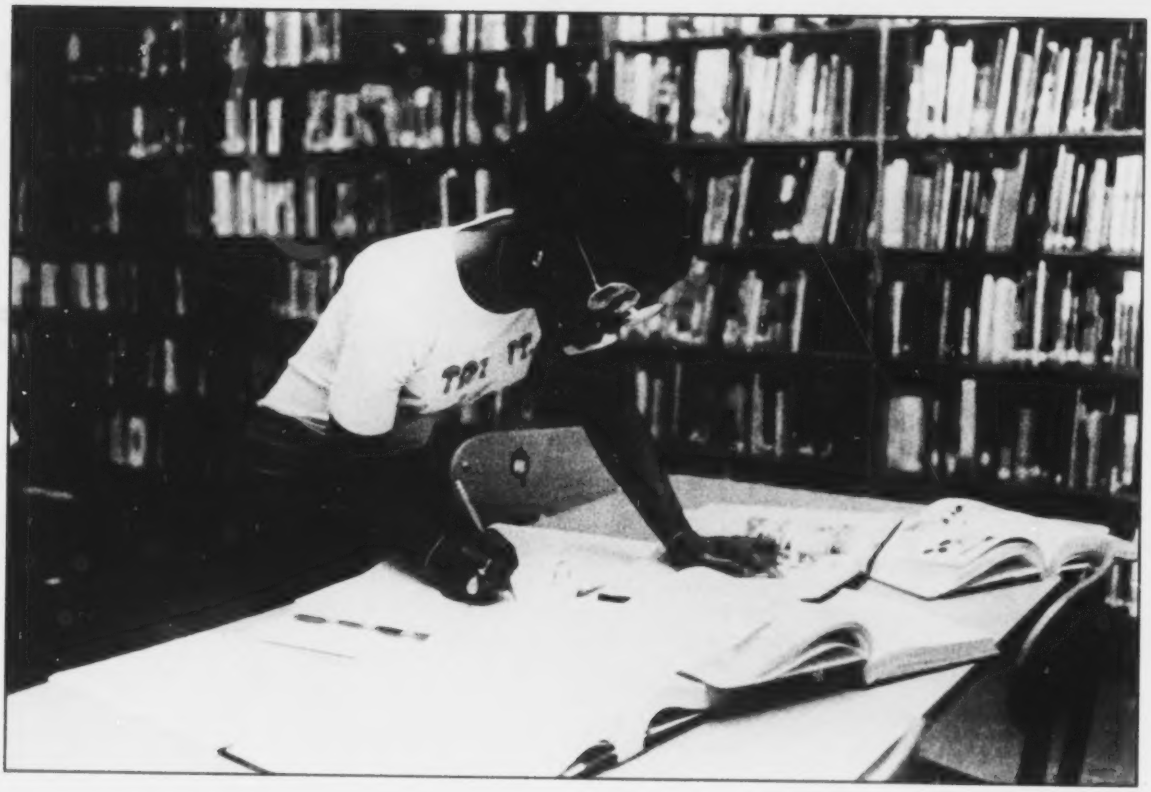


PART I

AN EDUCATION OF THINKING AND REASONING FOR ALL STUDENTS

B. Introduction

> The intellectual side of education consists in the formation of wide-awake, careful, thorough habits of thinking . . . There is no single and uniform power of thought, but a multitude of different ways.
>
> —John Dewey
> *How We Think*, 1910

Report Purpose and Structure

The purpose of this report is to provide education policymakers with a review of current research in the cognitive and social sciences and the implications of that research for improving instruction for all students, especially those student placed at greatest risk of school failure. It also identifies and categorizes the broad array of state initiatives to support higher order thinking and learning.

This report is divided into two major parts. The first part serves as a bridge between research in the cognitive sciences and educational policymakers and practitioners. It reviews recent research on thinking and learning emphasizing work on higher order learning, the role of knowledge in learning, and the development of a disposition for thinking. A section on subject-specific skills gives highlights of work in those areas. Two other sections provide discussions about what the teacher's role should be in supporting higher order learning for all students, and student assessment that supports thinking. The last section offers a list of specific programs whose stated purpose is to teach thinking.

The second major part of this report notes the findings of a national, state-by-state survey done by the Council during the spring of 1990. This survey asked that state education agencies identify their initiatives to encourage improved student thinking and higher order learning. Part II of this report provides an analysis of the survey returns. A comprehensive set of charts that describe state initiatives that focus on improving student thinking and reasoning are contained in Appendix II.

Just as the research on higher order learning describes critical analysis, problem-solving, persistence, cooperative experimentation, self-criticism and hard work as desirous elements of student learning, so too, the efforts by educators and others to improve teaching and learning for all students will require these same qualities. A clear vision of students as active, responsible, thoughtful, and ethical—throughout all the years of schooling from the primary grades to senior high school—must guide educators and policymakers in their efforts to restructure learning.

Thinking and Reasoning for All

Dewey wrote about an educational ideal—the development of "wide-awake, careful, thorough habits of thinking"—which was available only to a very small, elite group of students in his time. In the 1990's dramatic and fundamental changes in world economics and labor force composition, as well as necessary changes in workplace organization and skill requirements for workers combine to create a demand that *all* students receive an education that emphasizes both deep knowledge of subject areas and practiced thinking and reasoning.

Global economic competition of this sort which drives changes in the workplace and subsequent changes in labor force skills requirements will have direct consequences for schools. The demand of this new labor force is that workers—*all* workers at every level—will have well-developed abilities to learn easily and adapt to new situations encountered at work; to read, understand, and apply complex written materials; to use quantitative skills as tools of planning, analysis, and production; to speak and write effectively; to work in cooperation with members of teams; and to learn new skills through retraining for changing responsibilities (Resnick, 1987).

In addition to potential new demands for greater thinking and reasoning skills among workers, novel and complex social problems in this decade require thoughtful, deliberate and creative solutions by citizens. Civic responsibility in the 1990's means facing the negative results of social, political, economic and technological changes—growing disparity between wealthy and poor, increasing numbers of children in poverty, inequality based on race and gender, complex environmental threats, and unequal access to high quality health care, among others. In order to face these difficult problems and work successfully toward their resolution, responsible citizens must have the ability to perform critical analysis, organize and work in coalitions, make ethical judgements, and take principled, moral action.

Fortunately, at the same time that these demands for higher levels of thinking and reasoning abilities are placed on students as they leave school, the cognitive sciences have made important findings regarding the nature of thinking, and the teaching and acquisition of thinking skills. Advances in research in four broad areas about the nature of reasoning and the teaching of thinking have made significant contributions to what is known about human cognition. These four areas include developments in psychology (developmental and cognitive psychology as well as parallel discoveries in linguistics and neurophysiology); in philosophy (philosophical approaches and logic); in information technology (artificial intelligence, computer science, and information processing); and in curriculum innovation (pedagogical theories, instructional programs for teaching thinking skills, and research within subject area disciplines).

Insights from this collection of research provides significant direction to educators regarding how best to alter instruction to support higher order learning and the development of problem-solving skills. Such changes can result in a restructuring of learning, which will help fulfill the agenda of the 1990's and the next century—extending the teaching of high level thinking and reasoning abilities to *all* students.

Research shows that all students, except a very few who have severe mental disabilities, are capable of high levels of thinking and reasoning when provided with appropriate and effective instruction and social supports. Schools must adopt the research findings on thinking and teach all students a new range of cognitive skills required by the social, political and economic world these students will enter as adults. Earlier, schools were only asked to ensure the learning of basic skills. Schools must shift that emphasis and ensure that *all* students receive an education that supports higher order learning. A shift of this sort focuses sharp attention on those students placed most at risk of school failure, whose schooling frequently lacks a commitment to teaching for higher order learning. What is required is nothing less than a restructuring of learning.

CCSSO Actions

The Council of Chief State School Officers is committed to ensuring the provision of an education of higher order learning for *all* students, especially for those students placed at greatest risk. The Council's focus on the restructuring of learning is part of a longer and continuing priority emphasizing the educational and related needs of disadvantaged students. In 1987 the Council adopted a set of guarantees for educational and related services which, when implemented, should result in high school graduation of virtually all students. In 1988 CCSSO identified critical steps for providing high quality early childhood and family education for those most at risk as part of a strategy to ensure school success for all students.

In the following year, CCSSO examined efforts by states, local education agencies and national organizations to change the practice and organization of schooling in fundamental ways which would result in dramatically improved schooling for all students. As a result of that work the Council published a statement **Restructuring Schools: A Policy Statement by the Council of Chief State School Officers** and a report, **Success for All in a New Century: A Report by the Council of Chief State School Officers on Restructuring Education.** The statement offered principles and strategies for change for policymakers to consider as they work to improve elementary and secondary education. The report provided a detailed review of important elements of school restructuring and offered examples of efforts to restructure schools from around the nation.

Based on these efforts regarding school restructuring, the Council in 1990 centered its work on restructuring learning—fundamentally changing the relationship among student, teacher, knowledge, and other students in ways that support the development of higher order learning for all students. While reviewing current research, the Council found no single, universally-accepted definition of higher order learning, but learned of several key features of higher order thinking about which most researchers would agree. Higher order thinking is complex; yields multiple solutions; requires interpretation and the use of multiple criteria; involves uncertainty and finding structure in apparent disorder; demands self-regulation of thinking processes; and requires considerable mental work (Resnick, 1987).

The Council has examined a broad range of work related to improved student thinking: recent advances in cognitive research about the nature of thinking; new efforts within the disciplines of language acquisition, mathematics, science and social studies; successful programs that teach thinking skills; changing the teacher's role to better assist the development of student thinking; and altering assessment in ways that help support the teaching of higher order learning. As a result of this work, CCSSO has prepared a statement, **Restructuring Learning for All Students: A Policy Statement by the Council of Chief State School Officers on Improved Teaching of Thinking** and this report to guide state and local efforts to foster improved student thinking. The statement identified important principles which should direct state and local efforts to develop and sustain a curriculum of higher order learning. The complete text of the policy statement can be found in Appendix I. The Council has also produced a set of videotapes on restructuring learning for use as professional development materials by state and local education agency staff.

CENTRAL AMERICA
SOUTH AMERICA

C. Thinking and Learning Skills

Introduction

The growing consensus among educators, researchers, policymakers, student advocates, and business leaders that mastery of basic skills—basic literacy and numeracy—is an insufficient goal of public schooling, is driving an increased emphasis on teaching for improved student thinking. Whether based on national economic necessity or a sense of social equity, there is an expanding chorus of voices saying that all students, not only an elite few, need an education that supports critical and other higher order thinking.

This section of the report examines the discussion about thinking and learning skills. What does new research say about teaching thinking? And how might this research best be applied to improving instruction? In an effort to understand the points of agreement and disagreement among researchers who study thinking, it is necessary to examine a very wide range of disciplines. These fields include not only cognitive psychology, but represent considerable research in linguistics, anthropology, and in the specific subject areas of language acquisition, reading, and writing; mathematics and science; the social studies and the arts.

One way to facilitate a discussion about improving ways of teaching thinking is to use three organizing themes related to thinking. These three themes—higher order processes, knowledge in learning, and motivation for thinking—are neither unique to this report nor definitive areas of study, but rather, serve to help organize a remarkably wide, complex and occasionally controversial set of disciplines and points of view regarding the teaching of thinking. The following three sections discuss each of these areas.

Higher Order Processes

This section on higher order processes examines higher order learning and notes the false dichotomy between basic and higher order skills. It includes a review of several frameworks of thinking skills and discusses a variety of thinking styles. Following that discussion is consideration of the issue of infusing thinking into the curriculum and the critical notion of metacognition.

Defining Higher Order Thinking

In the discussion about improving the teaching of thinking there is a growing demand that all students develop higher order learning. Frequently, however, when one moves beyond the commonly-shared rhetoric there is great confusion concerning just what higher order learning is, how one alters instruction to support it, and how to assess the work of teachers and students to see if it has occurred.

A significant and growing collection of research in a variety of fields can lend assistance however, to help answer those questions. Resnick in her book, *Education and Learning to Think* (1987), points out that "higher order skills" enjoy a variety of definitions depending upon who is asked—philosophers, developmental psychologists, cognitive scientists, or educators. She says that a precise definition is difficult to craft but that there are certain key features that characterize higher order thinking:

- Higher order thinking is nonalgorithmic. That is, the path of action is not fully specified in advance.
- Higher order thinking tends to be complex. The total path is not "visible" (mentally speaking) from any single vantage point.
- Higher order thinking often yields multiple solutions, each with costs and benefits, rather than unique solutions.
- Higher order thinking involves nuanced judgment and interpretation.
- Higher order thinking involves the application of multiple criteria, which sometimes conflict with one another.
- Higher order thinking often involves uncertainty. Not everything that bears on the task at hand is known.
- Higher order thinking involves self-regulation of the thinking process. We do not recognize higher order thinking in an individual when someone else "calls the plays" at every step.
- Higher order thinking involves imposing meaning, finding structure in apparent disorder.
- Higher order thinking is effortful. There is considerable mental work involved in the kinds of elaborations and judgments required.

Basic vs. Higher Order Skills

There is an important argument directly related to this list of characteristics of higher order thinking. The argument has to do with the process of acquiring, developing, and using these skills. Resnick (1987) and others stress that higher order learning is not restrictively predicated on the mastery of some set of lower order skills.

She insists that the most important single message of modern research on the nature of thinking is that the kinds of activities traditionally associated with thinking are not limited to advanced levels of development.

> Instead, these activities are an intimate part of even elementary levels of reading, mathematics, and other branches of learning—when learning is proceeding well. In fact, the term "higher order" skills is probably itself fundamentally misleading, for it suggests that another set of skills, presumably called "lower order," needs to come first. This assumption—that there is a sequence from lower level activities that do not require much independent thinking or judgment to higher level ones that do—colors much educational theory and practice. Implicitly at least, it justifies long years of drill on the "basics" before thinking and problem solving are demanded. Cognitive research on the nature of basic skills such as reading and mathematics provides a fundamental challenge to this assumption. Indeed, research suggests that failure to cultivate aspects of thinking such as those listed [above] in our working definition of higher order skills may be the source of major learning difficulties even in elementary school (1987).

Nickerson (1988) concurs. He suggests that the single point on which researchers in this field agree is that teaching that has the rote acquisition of subject area knowledge as its primary objective is unlikely to foster thinking. He adds that it will also probably fail even to produce the desired knowledge acquisition, except in a relatively superficial way.

Resnick goes on in her book to explain in detail—based on an impressive collection of research—how the learning of reading and mathematics even at the earliest stages of learning, require higher order skills.

Cognitive Frameworks

Despite the list of characteristics of higher order thinking provided by Resnick, there appears to be no single, comprehensive and widely-accepted theory that describes the interplay of human intellectual functions. No individual conceptual framework has yet successfully captured the complex processes of human thinking. Nevertheless, several researchers, (Segal, Chipman and Glaser, 1985; Presseisen 1984; and Perkins, 1990) have attempted to categorize the many functions and skills related to thinking and have developed schemes that are useful in the effort to improve schooling in ways that will support student thinking.

While human beings can come to know something in several ways—perception, reasoning, and intuition—the focus on schools and on teaching thinking emphasizes the cognitive processes of knowing; the mental actions that drive the acquisition and generation of knowledge. Current research on thinking has generated numerous lists of cognitive processes that might be considered as thinking skills. One difficulty, and potential danger, of collecting lists of such skills is confusing the relative importance of the many skills identified.

Beyer (1984) notes that educators mistakenly tend to consider all thinking skills as similar in terms of complexity, utility, and function. He adds that there is considerable confusion regarding the definitions of these skills. He also points out that an obstacle to effective teaching and learning of thinking skills lies in the failure to identify with precision those cognitive operations that constitute the individual skills to be taught. He laments the significant gap in the literature when it comes to specifying the cognitive components of many thinking skills. For example, there is considerable difference between choosing identical types of poisonous snakes and discovering the antidote to the venom of a particular snake. The first involves the more fundamental processes of identification and comparison. The search for the antidote would require multiple, sophisticated, sequenced and replicable steps of problem solving. Beyer points to the research of Bloom (1956), Guilford (1967), and Feuerstein (1979) as several sources of scholarship which can be used to help define and prioritize skills accurately.

There is considerable disagreement among researchers regarding the usefulness of categories of thinking skills. Resnick argues forcefully against any sort of hierarchies of skills fearing a continuation of differential access to higher order learning (i.e., disadvantaged students will continue to receive "basic skills"). Others (Presseisen, 1988; and Marzano et al., 1988) say that categories can serve as useful organizers for teachers. This second group generally agrees with Resnick's equity concern arguing that *all* students should be taught thinking skills but tries to address Beyer's point about confusion regarding relative importance among skills. This disagreement remains unresolved. What follows is a brief review of several attempts to organize thinking skills.

Bloom's (1956) taxonomy of thinking skills, developed over 30 years ago, established six cognitive categories that contain behaviors that are expected of students as they learn. Presseisen (1984) charts Bloom's work in the following examples:

Knowledge:
Define, recognize, recall, identify, label, understand, examine, show, collect.

Comprehension:
Translate, interpret, explain, describe, summarize, extrapolate.

Application:
Apply, solve, experiment, show, predict.

Analysis:
Connect, relate, differentiate, classify, arrange, check, group, distinguish, organize, categorize, detect, compare, infer.

Synthesis:
Produce, propose, design, plan, combine, formulate, compose, hypothesize, construct.

Evaluation:
Appraise, judge, criticize, decide.

Guilford (1967) in his "Structure of the Intellect" created six categories of skills including:

- Units
- Classes
- Relations
- Systems
- Transformations
- Implications

Presseisen notes the parallel between Bloom and Guilford, and points out that some of the tasks listed by Bloom are also evident in Guilford's work. As an example she explains that recognizing a particular object would be a "units" skill; showing a group of similarly colored objects would be an "application" task; and forming a geometric structure out of a handful of match sticks would be a "systems" task similar to Bloom's "synthesis" category. She notes that the work of these two researchers share important dimensions related to the sequence of thinking skills and include: a move from simpler to more complex tasks, a shift from concrete to abstract dimensions, and change from work with familiar materials toward the creation of new products or approaches.

Based on her review of research in cognitive and developmental psychology, Presseisen offers three models of thinking skills. She acknowledges that there is a wide range of possible taxonomies of thinking skills but offers these models as a possible approach to understanding the processes of thinking. The first model emphasizes what she calls basic or essential thinking skills. The second model portrays how those skills are expanded to focus on even more complex thinking processes—"macro-process strategies"—which are based on the essential skills but use them for a particular purpose. The third model portrays "metacognitive" thinking skills, whose components will be incorporated in a later section of this report.

Her purpose is to help form a set of categories to explain the working relationships among different levels and different kinds of thought processes. This differentiation among skills treads on the basic skills vs. higher order skills debate noted earlier. In this instance Presseisen attempts to provide organization to the myriad specific skills identified as thinking skills—an effort criticized by Resnick. Presseisen attempts to establish relationships—admittedly tentative relationships—between and among the various skills. Her first model below, outlines essential thinking skills.

A Model of Thinking Skills: Basic Processes

Causation—establishing cause and effect, assessment:
Predictions
Inferences
Judgments
Evaluations

Transformation—relating known to unknown characteristics, creating meanings:
Analogies
Metaphors
Logical inductions

Relationships—detecting regular operations:
Parts and wholes, patterns
Analysis and synthesis
Sequences and order
Logical deductions

Classification—determining common qualities:
Similarities and differences
Grouping and sorting, comparisons
Either/or distinctions

Qualifications—finding unique characteristics:
Units of basic identity
Definitions, facts
Problem/task recognition

A Model of Thinking Skills: Complex Processes

HIGHER ORDER SKILL	PROBLEM SOLVING	DECISION MAKING	CRITICAL THINKING	CREATIVE THINKING
Task	Resolve a known difficulty	Choose a best alternative	Understand particular meanings	Create novel or aesthetic ideas/products
Essential Skills Emphasized	Transformations Causation	Classifications Relationships	Relationships Transformation Causation	Qualification Relationships Transformations
Yields	Solution Generalization (potentially)	Response	Sound reasons, Proof, Theory	New meanings, Pleasing products

A Model of Thinking Skills: Complex Processes

Presseisen builds on the essential thinking skills noted above and adds to it the research of Jozef Cohen (1971) who identified at least four different complex thinking processes:

- **Problem-solving**—using basic thinking processes to resolve a known or defined difficulty; assemble facts about the difficulty and determine additional information needed; infer or suggest alternate solutions and test them for appropriateness; potentially reduce to simpler levels of explanation and eliminate discrepancies; provide solution checks for generalizable value.

- **Decision Making**—using basic thinking processes to choose a best response among several options; assemble information needed in a topic area; compare advantages and disadvantages of alternative approaches; determine what additional information is required; judge the most effective response and be able to justify it.

- **Critical Thinking**—using basic thinking processes to analyze arguments and generate insight into particular meanings and interpretations; develop cohesive, logical reasoning patterns and understand assumptions and biases underlying particular positions; attain a credible, concise and convincing style of presentation.

- **Creative Thinking**—using basic thinking processes to develop or invent novel, aesthetic, constructive ideas or products, related to percepts as well as concepts, and stressing the intuitive aspects of thinking as much as the rational. Emphasis is on using known information or material to generate the possible, as well as to elaborate on the thinkers' original perspective. (Presseisen, 1984).

Presseisen explains that these complex processes draw on and elaborate underlying essential skills, and that certain of the essential skills may be more significant to one complex process than others. She adds, however, that current research has not yet successfully established clear and discrete relationships among these skills. Beyer (1984) agrees with this analysis and suggests that implementing an effective thinking skills program would involve introducing only a limited number of skills at a particular grade level, teaching these across all subject areas where appropriate, and varying the methods, media, and content of the presentations. He sees a gradual enlargement of the thinking skills base and more and more elaborate applications of those skills already learned.

Presseisen's second model—complex processes—relates the basic processes mentioned above in her first model to the processes identified by Cohen.

She notes that some complex processes are more directly tied to certain subject material than others. Mathematics and science might require problem-solving skills more than other subjects, for example. Social and vocational studies might more readily use decisionmaking skills and critical thinking might be more appropriate with language arts, politics and speech. Creative thinking could cross all areas but would have particular relevance for literature, art and music. Presseisen points out the interactive nature of learning thinking skills when she writes, "most important, the goals of the specific complex processes and objectives for learning in the particular subject area should be parallel and reinforcing."

Cognitive Styles and Intelligences

The notion that intelligence is a single thing—a discrete and solitary capacity, similar in essence among individuals but differing only in intensity—has long influenced the research and education communities throughout this century. Since the work in 1905 of French psychologist Alfred Binet who devised the first widely-used intelligence test, and the adaptation of his work by American Lewis Madison Terman who created the Stanford-Binet, intelligence has been seen as a single capacity to be measured.

The tests that measure this supposedly unitary phenomenon of intelligence emphasize the ability to recognize relationships and correlations of a particular sort. This approach assumes a limited conception of thinking and suggests a general disregard for content. Such a view is still prevalent in intelligence testing practices.

In a dramatic departure from those premises regarding the nature of human intelligence Howard Gardner (1983) in **Frames of Mind** offered a very different vision. Gardner examined empirical information on the human condition from several unusual vantage points. He studied biological, psychological and cross-cultural data. Specifically, he studied the development of the capacity to use symbols by normal and gifted children, and looked at the breakdown of cognitive capacities in brain-damaged individuals.

Based on his research, Gardner formulated his theory of multiple intelligences. He posited that humans possess seven relatively autonomous intelligences and devised several criteria that determine what is and is not considered an intelligence. He said that, in theory, intelligence "is defined as an ability, or set of abilities, that enables an individual to solve problems and fashion products that are of consequence in one or more cultural contexts. Intelligence is conceptualized not as a thing, but rather as a potential, the presence of which allows an individual access to forms of thinking appropriate to specific kinds of content" (Kornhaber and Gardner, 1989).

Gardner identified seven intelligences including:

1. **Linguistic Intelligence:** Involves a sensitivity to the meaning and order of words. Poets, translators, writers, and lawyers demonstrate highly developed linguistic intelligence.

2. **Logical-Mathematical Intelligence:** Includes the ability to handle chains of reasoning and recognize patterns and order. Mathematicians, scientists, logicians, financial analysts, accountants, engineers and most computer programmers make use of logical-mathematical intelligence.

3. **Musical Intelligence:** Involves sensitivity to pitch, melody, rhythm and tone. Musical intelligence plays a central role in the work of composers, singers, instrumentalists, conductors and audio engineers.

4. **Bodily-Kinesthetic Intelligence:** Centers on the ability to use the body in a skillful way and handle objects adroitly; to solve problems or to fashion products using part or all of one's body. Dancers, choreographers, jugglers, gymnasts and builders of machines apply bodily-kinesthetic intelligence.

5. **Spatial Intelligence:** Emphasizes the ability to perceive the forms of objects, the ability to recreate these without direct reference to them, and to manipulate or modify such images in space. Architects, airplane pilots, sculptors, surveyors, navigators, surgeons and engineers all rely on spatial intelligence.

6. **Interpersonal Intelligence:** Involves the ability to understand people and relationships, to notice and make distinctions among the feelings, behaviors, motivations and related attributes of other individuals. Religious leaders, politicians and salespeople use interpersonal intelligence.

7. **Intrapersonal Intelligence:** Consists of a core capacity permitting individuals to access their own feelings as a means to understand oneself and others. Therapists and social workers depend on intrapersonal intelligence.

Gardner presents a very compelling argument favoring the development of all seven intelligences by schooling. Currently schools support the "hegemony of linguistic and logical-mathematical intelligence" (Kornhaber and Gardner, 1989). He maintains that the rigid adherence by schools to this narrow view of intelligence will fail to "connect" with a large number of students, that it will not support the full development of all students, and that it does not adequately prepare students for the demands of life outside the school building.

Gardner has worked in several ways to support the adoption of educational approaches that are sensitive to and supportive of the seven intelligences he has identified. He has assisted the staff of the Key School in Indianapolis, Indiana, a public school whose staff decided to alter their instructional practices and organization based on Gardner's work.

Recognizing the pivotal role of student assessment in determining the content of schooling, Gardner has turned his attention to testing also. Working with the Educational Testing Service, Gardner assisted the Pittsburgh Public Schools develop Arts PROPEL, a new approach to evaluate students' work in the arts. He is also, in collaboration with David Feldman at Tufts University, working on Project Spectrum, an assessment program that attempts to measure a far greater range of abilities than current I.Q. tests do.

Unlike Gardner who maintains that humans possess multiple intelligences, Robert Sternberg (1990) suggests that people use different styles of intelligence and different styles of thought. Like Gardner, however, he believes that people can be smart in different ways. Sternberg identifies three major styles of intelligence: the analytic, the synthetic, and the practical style. Students who rely on the analytic style typically can remember and analyze other people's ideas and usually succeed at traditional school tasks because those tasks require memorization and simple problem-solving.

A student strong in synthetic style tends to do only moderately well, if that, in tests of most kinds but whose teachers regard as a good student despite the low test scores. Students of this sort generally do well in all sorts of academic work but who do not "test well." Sternberg explains that the tests that schools use simply do not measure the sorts of intelligence at work with someone who manifests a synthetic style.

Students with practical intelligence generally have passably good grades and test scores but do extremely well in the job market. They have, according to Sternberg, common sense; they would have "street smarts." For example, they would know how to behave with teachers and students, how to get work done, and how to interview well.

Sternberg explains that people are not merely intelligent in one of the three areas but rather develop some sort of balance with strengths in one or the other. He also points out that just as people have different styles of intellect, they also have different styles of thought; of applying their intellect in their thinking. He says that these thinking styles, or ways of exploiting intelligence, must be understood by teachers in order for students to benefit maximally from instruction.

Sternberg (1990) identifies three styles of thought and he likens them to the three branches of government: executive, legislative, and judicial. Individuals with an executive style are implementers. They like to follow rules, to figure out which of already existing ways they should use to get things done, to fill in content with existing structures, and prefer problems that are restructured or prefabricated. The legislative style characterizes individuals who like creating, formulating, and planning for problem solution. They like to create their own rules, to build structure as well as content in deciding how to approach a problem, and enjoy doing things their own way. They prefer creative and constructive planning-based activities such as writing papers, designing projects or creating new business or educational systems. Judicial types like to evaluate rules and procedures, to judge existing structure and content, and prefer activities that exercise judgement and evaluation.

Individuals tend to specialize in one type of thought but not exclusively so. Sternberg adds that although style is independent of level of intelligence, generally, it probably is not independent of intelligence within a particular domain. He explains as an example, that the same individual who might be thought to be a brilliant scientist because she or he is a legislative type, might be thought to be somewhat duller in a field such as business management that relies more on executive skills.

The critical issue of schooling related to styles has to do with differences between teacher and student. Sternberg argues that teachers frequently tend to confuse styles with quality of mind. Because both students and teachers tend to exploit their preferred styles and because not all students will match the teacher's style, those students who differ from the teacher may be unfairly penalized. He points outs, "since teaching often reflects teachers' personal thinking styles, we inadvertently reward students whose styles correspond to ours at the expense of those whose styles differ. Thus, we label as 'slow' or even 'stupid' those students who think and learn well but in ways that are different from our own." (Sternberg, 1990). Sternberg offers examples of how teachers can alter their instructional practices in ways that take into account a variety of styles of thought and support learning across their skills vs. infusion. Hilliard (1990) adds additional caution related to the work of both Gardner and Sternberg. Hilliard says that we must assume that learning styles or intelligences are distributed equally across all groups. He argues against attaching a particular intelligence or style with a specific ethnic group or gender.

Skills vs. Infusion Approach

Among the various points of view and particular strategies and approaches regarding the development of thinking skills, there is considerable discussion about whether thinking skills are best taught in separate courses or infused into the regular curriculum across subject areas. Those who propose a "skills" approach usually identify specific, component skills in thinking and organize practice of those skills through exercises considered "content free", or at least not linked with any single subject area or discipline.

Assuming that there are skills involved in thinking which are independent of content, then it makes sense that students should be taught such skills in order to improve their learning. Examples of so-called generalizable skills could include: searching for evidence, seeking counter-arguments, using analogies, and suspicion of evidence supporting one's own prejudices, among others. Despite the relative success of efforts by Feuerstein (1980) with his Instrumental Enrichment and Pogrow's (1989) Higher Order Thinking Skills (HOTS) which are both described as content free, much current literature (Resnick, 1987; Perkins and Salomon, 1989) criticizes the skills approach, at least to the extent that any such program would lessen an emphasis on teaching thinking within subject areas.

While thinking skills can be learned in what Presseisen (1988) refers to as content-incidental, or perhaps even in content-free situations, most advocates of cognitive instruction (Glaser 1984; Kuhn 1986) stress the importance of mastering skills embedded in specific subject disciplines. They argue that the methods of the particular discipline reflect the criteria or rules of problem-solving in that domain, and such standards are related to the appropriate strategies one builds over time. Resnick (1987) says that better thinkers develop "nuanced judgement" after they have experience with content and after substantial wrestling with problems rooted in contextual relationships.

Nickerson (1988) agrees with Resnick, but he modifies his stance a bit. His position is that domain-specific knowledge is a necessary but not sufficient condition for thinking deeply and effectively about a domain. He argues that without some conception of a particular domain, one cannot think about it all. He continues,

> If one lacks the concepts that define quantum electrodynamics, one really cannot think about that subject. On the other hand, a head full of facts about a domain does not guarantee that one will think effectively about the domain. Indeed, there is a sense in which knowledge may sometimes make thinking unnecessary. This would be true, for example, when what appears to be a difficult problem is solved quickly by someone who happens to know the solution because he encountered precisely the same problem a short time ago. Perhaps on the first occasion finding the solution required much thought, but on the second it did not. In the most productive marriages of domain knowledge and thinking ability, knowledge serves as a stimulus to discover more. To the thinking individual, knowledge stimulates inquiry and reflection. While it makes thinking about some questions unnecessary, because the answers are known, it provokes questions about what remains to be learned.

Perkins and Salomon (1989) point out that general cognitive skills do not function by somehow taking the place of domain-specific knowledge, nor by operating in exactly the same way from domain to domain. Rather, cognitive skills are general tools in their judgement. They compare cognitive skills in this sense to the human hand. They say that hands alone are not enough; that people need objects to grasp and hold. As we reach for an object, whether a stick or a ball, we shape our hand to ensure a good grip. We also learn to pick up different things appropriately. We do not pick up an infant the same way we pick up dirty laundry, for example.

They explain that general cognitive skills operate in a similar fashion. They can be considered as general gripping devices for retrieving and wielding domain-specific knowledge. They function as hands that need pieces of knowledge to grip and wield and that need to configure to the specific knowledge in question. They use as an example the strategy of thinking of "counterexamples:"

> As you learn a new subject matter, trying to think of counterexamples to claims surely is a good critical posture to maintain. But you have to accumulate knowledge in the domain with which to find or build counterexamples. And you have to develop a sense of what counts as a counterexample in the domain. Similarly, in applying to this new domain a reading strategy that asks you to summarize, you have to develop a sense of what counts as relevant. Or, in applying an extreme case heuristic to the new domain, you have to find out what dimensions are significant, so that you will know how to push a proposition to an extreme meaningful in that

> domain. (Perkins and Salomon, 1989)

They stress that all specific applications of anything general need to configure to the context. With this approach they acknowledge the "importance of domain-specific adjustments, which indeed often are challenging, while maintaining the reality and power of general cognitive skill." (1989).

Transfer of Skills

The question about whether to use a skills or infusion approach begs a more fundamental question, however. This question has to do with the notion of "transfer." The critical test of an approach adopted in teaching thinking is whether the competence acquired from instruction can be applied in a new context, different from that in which it was learned. A problem-solving approach learned in mathematics or science may have been successfully applied by the students in the context they studied it. But are the skills learned in those subjects transferable to other domains?

Swartz (1987) refers to areas such as history and social studies, and professional training programs in law, medicine and engineering as examples where the problem approach has been adopted with the aim of developing thinking within a context of specialized knowledge. He notes in detail how problem solving can successfully be infused in several subject domains in ways that reinforce thinking skills. Again, the question that remains unanswered is how to ensure that these specific thinking skills and domain-rooted strategies can and will be applied across the curriculum. Do aspects of mathematical thinking transfer to issues more directly related to social studies or ethics and vice-versa?

An excellent review of the literature and issues related to the discussion of transfer can be found in an Organization for Economic Development and Cooperation (OECD) background paper written for that organization's conference in Paris on teaching thinking. **The Curriculum Redefined: Learning to Think-Thinking to Learn** (OECD, 1989) offers a useful synopsis of the major questions, debates, and trends in education and the cognitive sciences regarding the teaching of higher order thinking skills. It provides a particularly helpful examination of transfer.

Perkins and Salomon (1988) examine the issue of transfer and identify two separate mechanisms for it to occur. They use the terms "high-road" and "low-road" transfer. Low-road transfer takes place like an "automatic triggering of well-rehearsed schemata." For example, when one applies known abilities of driving a car to driving a truck, low-road transfer occurs. Successful low-road transfer depends on perceptual similarities and it could be described as backward reaching—finding related experiences from the past (OECD, 1989). High-road transfer requires a more conscious choice of action. High-road transfer involves "active decontextualization and restructuring . . . the deliberate mindful abstraction of a principle and its application to a difference context." (Perkins and Salomon, 1988). It involves abstract thinking and sophisticated management of one's thinking. Unlike low-road transfer it is forward reaching by aiming to predict or anticipate.

Transfer has important implications for teaching. Perkins and Salomon criticize thinking skills programs for failing to establish the requisite conditions for transfer. They say that while both forms of transfer are needed, one needs to know when each is appropriate. They recommend teaching "hugging" and "bridging." To facilitate low-road transfer teachers need to emphasize hugging—demonstrating linkages, applications, and examples wherever possible. For bridging that assists high road transfer, teachers should "mediate the needed processes of abstraction and connection making," pointing out principles and encouraging students to make generalizations (OECD, 1989).

Metacognition

The term metacognition, while a major point of research and theory, is becoming more widely used but not always well understood. Flavell (1976), who has written a considerable amount on metacognition, says that it refers to one's knowledge concerning one's own cognitive processes or anything related to them. It also refers to the active monitoring and subsequent regulation and orchestration of these processes usually in pursuit of some concrete objective or goal. In other words, metacognition involves being aware of our own thinking while we perform particular tasks and then using this awareness to direct or re-direct what we are doing.

Marzano and his colleagues (1988) review the work of several psychologists and explain that metacognition involves two primary aspects of knowledge: knowledge and control of self, and knowledge and control of process. They cite additional research to support the idea that knowledge and control of self includes the elements of commitment (e.g., aligning skill with will), attitudes (e.g., persistence, learning from failure, striving to work beyond what one thinks one can do, awareness of available resources), and attention (e.g., monitoring and controlling commitment, attitudes and attention). They argue that teachers can support, model, and teach these behaviors in the classroom by calling attention to them and making them explicit, as well as practicing them themselves.

Marzano et al. (1988) call on other research regarding knowledge and control of process. Here they stress two elements: the types of knowledge important in metacognition and the executive control of behavior. They say that three types of knowledge are essential to metacognition. The first is declarative or factual knowledge. The second is procedural knowledge which includes information regarding the various actions to be performed in a task. It is the knowing how to do something. The third sort of knowledge necessary is conditional knowledge, or knowledge about why a given strategy works or when to use one skill or strategy as opposed to another. They write, "To exert metacognitive control over a process, then, students must know *what* facts and concepts are necessary for the task; *which* strategies, heuristics, or procedures are appropriate; and *how* to apply the selected strategy, procedure or heuristic."

The second element related to knowledge and control of process that Marzano et al. identify is executive control of behavior. This involves evaluation, planning, and regulation. According to their model, evaluation includes assessing one's current knowledge state. ("Do I understand what I have read? Have I encountered a problem like this elsewhere? Do I need additional information before I proceed?). It also includes assessing goals and subgoals related to the task at hand. Planning involves the deliberate selection of strategies necessary to meet one's goals. Regulation is the process of checking progress toward fulfillment of the goal. Teachers should model these behaviors and encourage students to follow them. Costa (1985) provides instructional strategies for teachers to incorporate these methods and behaviors in their classrooms.

Marzano and his colleagues (1988) ask rhetorically what an emphasis on metacognition can mean for a classroom teacher and for students. The answer is not surprising but important. "First, emphasis on students' self-control and responsibility for that control in the classroom can be overt and direct. Students can learn that self-monitoring is a valued, high-level skill. They can systematically develop commitment, a positive and personal attitude toward learning, and attention through introspection and practice." This approach assumes, of course, that not only are students taught about such skills and strategies but have ample time and assistance to practice them in their regular subject area work.

A significant question regarding metacognition has to do with its relation to the methods and content of everyday teaching. There exists a wide array of efforts to improve instructional method including among others: collaborative learning, problem-based learning, and Socratic teaching and questioning. So, too, there are numerous attempts to amplify and deepen the content in various subject areas. Perkins (1990) applauds such efforts but cautions against an overemphasis on improvement of content and method to the detriment of what he calls "metacontent," or in its more complex state across all subject domains, the "metacurriculum."

In his paper, **Creating the Metacurriculum**, Perkins (1990) provides an extremely useful schema for the restructuring of learning. He describes a triad of three elements in the learning enterprise: content, method and metacurriculum, all three of which require significant attention. A review of his work can be useful as one considers the role of metacognition in the improvement of all students' learning.

According to Perkins there are important kinds of knowledge and know-how that are not ordinarily acknowledged by typical, or even enlightened, notions of subject matter. The metacurriculum, in his description, is not only deeply related to subject matter, but also an essential part of what is necessary to understand a subject matter.

Perkins says that the metacurriculum draws on two key concepts: "metaconceptual" knowledge and "metacognitive" knowledge. Metaconceptual knowledge posits that besides the basic concepts of a subject matter, there are more abstract organizing ideas embedded in the structure of that subject matter. He offers history as an example. At the conventional subject level history is a story of what happened and why it occurred as it did. But within history there is also a form of historical explanation—how historians explain things; what evidence historians choose; and how they validate historical claims. Michaels and O'Connor (1990) in their work on discourses and literacies would add how historians (or professionals in other fields) speak, thing, act, write, and what subdiscourses they use in their professional journals and papers. For both Perkins and Michaels, the characterizations of (in this case) historical explanation and evidence are a crucial part of the metaconceptual structure of history as a discipline.

Perkins calls for three strategies to draw attention to the metaconceptual side of the metacurriculum:

1. Build learners' awareness that subject matters have metaconceptual aspects—rules of the game, overarching principles and premises, etc...

2. Encourage reflection upon these metaconceptual aspects—e.g.,

what makes history, in contrast to other disciplines?

3. Encourage students' involvement in not just knowing historical facts and concepts (for example), but in historical thinking—generating explanations, validations, etc...

The other key concept related to the metacurriculum is metacognitive knowledge. He explains, like the several researchers earlier, that metacognitive refers not to knowledge and awareness of the structure of disciplines but, instead, knowledge and awareness of one's own cognitive processes and how they are best used. He has three strategies to foster attention to the development of metacognitive knowledge:

1. Cultivate students' awareness of their metacognition—especially their background beliefs about how best to think and learn (which may be incorrect and self-defeating).

2. Promote reflection upon and extension of students' metacognitive knowledge (for instance, acquisition of new and more powerful strategies).

3. Encourage and support students' active use of their metacognitive repertoires in subject matter learning and activities outside of school.

Hence, the metacurriculum functions as the combination of metaconceputal and metacognitive knowledge. In tandem with rich content and effective instructional methods, it serves as a potential comprehensive blueprint for the restructuring of learning.

Perkins gives a more detailed account of the metacurriculum when he discusses five different facets of its nature. He identifies levels of knowledge, languages of thought, integrative mental models, learning to learn, and teaching for transfer as the essential components of the metacurriculum. Teachers must make these procedures, discourses, and structures explicit and overt for students and support their use of them in different subject areas.

Levels of knowledge, the first element of the metacurriculum, involves the kinds of knowledge and know-how about effective problem-solving in particular subject areas. It also includes the way explanation and justification are handled within a subject. Typically, conventional schooling pays almost no explicit attention to the patterns of explanation and justification and so does not ensure that students fully understand them, despite the central role they play in the subject areas. Work by Michaels and O'Connor (1990) is particularly useful in explaining the nature of subject specific discourses.

The second facet of the metacurriculum, languages of thought, includes the concepts, discourses and conceptual frameworks that direct thinking in and across subject areas. Perkins calls for restoring "mental state terms" (hypothesis, evidence, argument, etc.) in order to reinforce the language of thought. He says that these terms used to be emphasized in school textbooks but have been dropped over time. He bemoans the loss of direct reference in textbooks to the terminology of thinking or mental state terms. He says that this loss robs from students, not flashy and esoteric skills, but the everyday encounter with "the common heritage of our language of mental state terms [in] the educational setting."

Related to his emphasis on the restoration of mental state terms to textbooks, Perkins encourages the teaching, not so much of lock step, specific thinking skills, but of "certain sub-languages or idioms." He says that good causal reasoning, flexibly construed, involves a set of significant concepts (e.g., cause/effect, sufficient/contributing cause, etc.), associated standards and cautions (e.g., avoiding the assumption that correlation equals causation), and the application of these to various areas of the curriculum. In his model, students would learn the flexible use of these sets or idioms rather than the simple imposition of particular strategies in every situation. In support and as an example of widespread successful use of this idea he cites the research and evaluation of Project Intelligence which has received considerable support from the government of Venezuela (Hernstein, Nickerson, Sanchez, and Swets, 1986). He also recommends the use of pictoral, graphic organizers—"concept mapping" (Novak and Gowin, 1984)—to "download" the complex cognitive languages of thoughts that in classrooms are largely oral. To support such work he calls for the creation of a culture of learning in the classroom. He would have the hidden curriculum and social relations of the classroom (Giroux, 1981) designed to support thoughtful and empowering work; the creation of a "thoughtful classroom."

A third component of Perkin's metacurriculum is the use of integrative mental models. In the effort to show the interrelationships of the discrete pieces of content in the curriculum, the teacher needs somehow to help students integrate the knowledge they are acquiring and creating. He points out the problem that students often lack a clear understanding of foundational concepts critical to the subject matter. He recommends providing students with "imagistic mental models" to help them develop an intuitive sense of concepts as they study the formal subject matter. He cites several examples of successful efforts to do so. One example is White and Horowitz's (1987) work with computer software called Thinker Tools which allows students to alter variables of gravity, friction and other simulated forces and so study Newtonian motion.

Perkins also calls for wider use of "constructed stripped visual analogs" that provide students with multiple analogies that isolate the difficulty by highlighting the critical features (he says the use of single analogies can suggest over-simplified, flawed parallels).

The fourth element of the metacurriculum is learning to learn. Perkins notes that as humans we learn to learn, but that we do not always learn the most effective methods. Research by Dweck and Bempechat (1980) on student theories about how they learn suggests two major types of approaches to learning. The first, "entity learners," believe that "you get it or you don't," whereas "incremental learners" hold that learning is a question of "catching on" and requires persistence. Perkins (1990) says this difference is critical, "students with an entity attitude toward learning have a cognitive theory about the nature of learning that is fundamentally counterproductive and needs reshaping toward the more potent incremental attitude." Hence, the question of student held learning theories becomes a point of intervention by teachers—students who are entity learners need guidance and support to shift from an attitude about learning that is largely self-defeating to one that encourages continuing effort.

To support learning to learn, Perkins says teachers should also assist students to track/monitor their own attention, teach good thinking strategies, and support them as they use these strategies in difficult tasks. He notes that teachers must not let thinking strategies become "inert knowledge"—knowledge displayed in response to a direct quiz or test but not used spontaneously or flexibly in situations that allow wider use of such knowledge. Teachers must help students put their passive knowledge into action and learn to use thinking strategies appropriately.

Perkins identifies teaching for transfer as the fifth and last aspect of the metacurriculum. As discussed earlier in this report, transfer refers to the use in one context of some aspects of new knowledge and skills learned in a different context. Transfer, in this sense, deals with the bridging of knowledge across aspects of one subject, across various subject matters, from school to street, and from school years to adulthood. Perkins reviews considerable (and often contradictory) evaluation research regarding successful transfer and concludes that students can transfer knowledge and skills across subject matter and to a variety of out-of-school contexts *provided* that instruction sets up conditions for transfer. He points out with regret that "most instruction proceeds in an encapsulated style that does not favor transfer." (Perkins, 1990).

One example of research pointing to successful transfer is Ann Brown's (1988) study of whether young children would transfer concepts from one setting of application to another context. A few of the conditions Brown identified to make transfer more likely include:

1. The knowledge to be transferred is involved in cause-effect relationships;
2. There is emphasis during learning on flexibility and the possibility of multiple application; and
3. There is some effort to disembed the principle from the initial learning context.

The last two conditions parallel the work by Perkins and Salomon (1989) on high road transfer described above.

Taken together these five elements broaden the conception of the metacurriculum beyond mere thinking skills. Efforts to teach thinking skills over the past several years have been the most visible manifestation of concern for expanding student thinking and which are certainly *part* of what Perkins would describe as the metacurriculum, but Perkins' notion of the triad—content, method, and metacurriculum—offers a more complete picture of what educators must consider in the effort to restructure learning.

Knowledge in Learning

Knowledge in learning has to do with what one thinks about when learning to improve one's thinking. It is actually an extension of the skills vs. infusion debate noted earlier where the question is whether one learns thinking skills best in the abstract—separated from any particular content—or embedded in the content of subject matter. A related, important concern here is that while different domains require thinking skills that may be similar, more importantly they often require thinking skills that are particular to that domain.

Resnick (1987) shares the qualified enthusiasm of her many colleagues regarding the direct teaching of thinking skills outside the context of specific knowledge domains, and she is hopeful with regard to the related issue of successful transfer of skills learned in one area to use in other areas. She adds however, that because of the paucity of solid evaluation research on the question of transfer, the issue remains open.

After reviewing a substantial body of approaches to support thinking Resnick says that, based on current empirical evidence, there is no single, silver bullet that can be declared a wholely successful approach for teaching thinking skills. While she does offer guarded optimism regarding several programs, she says that if we were to wait before receiving definitive empirical support for a particular approach to higher order skill development we would be held to inaction. Rather, she argues that "prudent educational practice" should move to embed the teaching of cognitive skills in the traditional school disciplines. She maintains that this effort should move forward regardless of any separate courses in thinking skills.

Resnick insists that embedding the teaching of thinking in the disciplines offers several advantages. She cites three. First, based on the fundamental cognitive research finding that knowledge plays a critical role in reasoning and thinking, the discipline-embedded approach provides a natural knowledge base and a setting in which to develop, practice and perfect higher order skills. She explains that one cannot reason in the abstract, that one must think about something. The school subjects represent disciplines with a rich body of material for problem-solving and training in critical thinking.

A second reason to infuse the teaching of thinking skills directly into subject areas is that doing so provides criteria for what constitutes good thinking and reasoning within each disciplinary tradition. The various disciplines have patterns of reasoning especially suited to each. Resnick uses physical sciences, math and the social sciences as three examples of disciplines with characteristic ways of reasoning. In the physical sciences, particular combinations of inductive and deductive reasoning shape reasoning and problem-solving, by appeal to mathematical tests and checks by an extensive body of agreed-upon fact. Mathematics, on the other hand, is virtually alone in its requirement of formal proofs. Different still are the social sciences where valid reasoning and effective problem-solving are much influenced by traditions of rhetorical argument, of weighing alternatives, and of the building of a case for a proposed solution.

Resnick's third argument in support of embedding higher order skill training within the disciplines functions as an insurance policy. She suggests that to pursue an infusion approach is to ensure that students will learn something worthwhile even if wide transfer proves unattainable. She is quite serious about this point, however. She argues strongly against sole reliance on separate courses for teaching higher order learning but instead, proposes that if a subject matter is worth teaching in school it is worth teaching at a high level—to all students. Resnick points out the paradox that ending the quest to discover general skills might become the most powerful force behind the cultivation of generally higher levels of cognitive functioning, because it forces an emphasis on knowledge in the subject areas.

Clearly, a decision to embed higher order learning in traditional school subjects would transform the curriculum and related instructional approaches in fundamental ways. The paramount goal of *all* teaching would then become the development of higher order skills.

Resnick (1987) admits that such a fundamental shift will be very difficult. She admits that the traditional approaches related to this issue are frequently more a hindrance than help and she points to several examples. She notes that the classic distinction between knowledge as something one reasons *about* and skills as something one reasons *with* has, in practice, created a competition between knowledge and skills for limited instructional time. She explains that the idea that certain forms of knowledge can be powerful tools for problem-solving and learning, or that procedures and regimens are an expression of principled knowledge, are ideas that scholars and educators can agree on but they have not yet successfully found ways to act on. These two groups have not been able—on any large scale—to take these potent ideas and alter instruction in a way that takes advantage of what they have to offer for student learning.

There seems then, to be a necessary and fundamental first step in the effort to restructure learning to support higher order skill training for all students. In order to begin transforming the process of schooling, one should concentrate on those parts of the traditional curriculum that enable thinking and learning in several fields. Resnick suggests to begin this work of change with the 3-R's—reading, writing, and arithmetic (mathematics)—and adds a fourth R, reasoning. She says in reading, teachers must engage students in "meaning constructing activities" based on texts in settings that incorporate modeling of good performance, opportunities for students to experiment with an array of tasks, and lots of feedback from teachers.

The teaching of writing must move beyond the strategy of writing merely as "knowledge telling" (Scardamalia and Bereiter, 1985), and instead emphasize its use as an intentional process. In this second, higher order sense, the writer does not merely tell what he or she knows, but rather uses writing as a problem-solving process—a tool for constructing and expressing arguments—managing topical knowledges, linguistic knowledge, processes of attention and judgement, subject-based discourses, and knowledge of rhetorical forms.

Mathematics—a considerably different discipline than reading and writing, dependent on formal notations—is both an enabling skill and a discipline with its own knowledge structures. It is typically taught as the memorization of rules for formal symbol manipulation with little understanding by students (and many teachers) about why the rules work as they do and what the symbols mean. Teaching mathematics for higher order learning requires the breaking of the artificial separation of symbol and meaning and of calculation and mathematical reasoning.

The fourth "R"—reasoning—never a regular part of mass education, has traditionally been only part of education for a small elite. Incorporating reasoning and critical thinking into the regular educational system would extend the "high literacy tradition" into the entire public school system (Resnick, 1987). The critical questions related to teaching reasoning have to do first, with expanding access to this sort of higher order learning and second, with ensuring that the study of reasoning and logic does not become just another body of knowledge, studied in ways that will impart discrete collections of information rather than functioning as the locomotive of higher order thinking and learning.

Disposition/Motivation for Thinking

Thinking can be hard work. There seems to be an increasing awareness among proponents of teaching for higher order learning of the central importance of attitude and disposition as determinants of the quality of thinking (Baron, 1985; Ennis, 1985; Nickerson, 1986; Resnick, 1987). Nickerson lists some of the attitudes that are seen to be conducive to good thinking: fair-mindedness and openness to evidence on any issue; respect for others' opinions that differ from one's own; a tendency to reflect before acting; and inquisitiveness and a desire to be informed.

The last attitude of the list, inquisitiveness and a desire to be informed, is fundamentally important to the successful teaching of thinking. Providing students with a multitude of cognitive strategies will do little if the students are uninterested in using them to work through difficult problem-solving. While there is little psychological literature on the importance of motivation as it relates to the teaching of thinking, common sense and related research dictates that motivation is an extremely important factor because thinking can be hard work. It is easier to adopt an opinion and hold it against all reason than to seek information and reassess one's stance on an issue when new relevant information is available. Nickerson (1988) points to the pivotal role motivation plays when he writes, "How to teach students—how to teach ourselves—to *want* to be rational intensely enough to be willing to spend the intellectual energy that rationality requires is a fundamental question that has not yet begun to get the attention it deserves." At question is the successful development and cultivation of the disposition to higher order thinking.

The sort of higher order thinking proposed in this report involves elaboration, adding complexity, investigation, going beyond the given to construct new formulations of issues. It demands the weighing of alternatives and the acceptance of levels of uncertainty. Hence, it requires work—and perhaps the most difficult aspect for some—it demands a degree of social risk. Higher order thinking does not always allow instant answers, nor arriving at expected answers, and of disagreeing with others perceived as being more powerful (Resnick, 1987). In order for students to tackle the work required and overcome the difficulties noted above, schools must drastically change much current practice as well as the relations within the classroom—relations regarding power and knowledge—in order to cultivate not only the skills for thinking but the disposition to use them.

Key to the development of such dispositions is the social setting where students are expected to practice thinking skills. Resnick identifies a set of widely shared assumptions regarding how dispositions for higher order thinking might develop. They center on the role of the social community and how it establishes norms of behavior and creating opportunities for learning and practicing these skills. The social community must value thinking and independent judgement in order for the students to develop dispositions favorable to such behavior. In addition to initial opportunities to learn and practice particular skills, to develop a disposition for their use in higher order thinking requires sustained, long-term cultivation.

The role of the social community—and the creation and sustenance of such a community within the classroom—will be discussed further in the section on the role of the teacher. The teacher, not surprisingly, figures prominently in the development of a supportive community that fosters a disposition for thinking.

What will magnets pick up

D. Subject-Specific Skills

The purpose of this section is to provide a brief description of the advances in research, theory, and instructional approaches in the general subject areas of language, mathematics, science, and social studies. There are vast and complex—and sometimes contradictory—bodies of research related to each of these areas, as well as sophisticated research in sub-categories as well. This report does not attempt to touch on all issues and advances in each subject area in a comprehensive review of the literature nor does it propose that the subjects chosen are by any means an exhaustive list. One could legitimately argue for the inclusion, for example, of the arts (drawing, painting, sculpture, dance, music, drama, etc.) or of technology (computer programming, models, languages, systems, etc.). Instead, the purpose is to illustrate key points related to teaching within several subject areas in ways that foster thinking and reasoning.

Language

According to current research in reading, the written text and the mental representation constructed by the reader do not match exactly but, rather, the written text serves as an incomplete bridge between two thinkers—author and reader. In the act of reading, the reader fills in unwritten, common assumptions held by both the reader and author. The reader's representation both omits and adds details to the text to construct meaning. What these activities mean, is that reading *at any level* requires thinking.

Kirtsch (1979) identifies four kinds of knowledge readers call upon to construct meaning from texts: linguistic knowledge (how sentences are formed, rules of forward and backward reference, how to link object to action), topical knowledge (knowledge about the text's subject matter), knowledge about rules of inference, and knowledge of conventional rhetorical structures. Readers use these different kinds of knowledge continuously while reading—and making meaning—out of challenging texts.

Baker and Brown (1984) present several strategies involved in reading to learn, which they say are similar to those used in learning mathematics and science. They point out that reading demands a variety of higher order skills and problem-solving activities because reading is problem-solving. Baker and Brown say that skilled readers *plan* their approach to the task, *monitor* their learning as they read, apply *strategies* to foster and support learning, *evaluate*, and if necessary *revise* their approach to learning from the text. Such skills could be considered metacognitive skills as discussed earlier in this report.

Brown (1980) says that reading is thinking and that thinking demands effort and skill. She lists several concrete versions of general monitoring activities for the domain of reading:

- Clarifying the purposes of reading (i.e., understanding the task demands, both explicit and implicit);
- Spontaneously making use of relevant background knowledge;
- Allocating attention so that concentration can be focused on major content at the expense of trivia;
- Critically evaluating content for internal consistency and comparability with prior knowledge and common sense;
- Monitoring ongoing activities to see if comprehension is occurring, by engaging in activities such as periodic self-review;
- Drawing and testing inferences of many kinds, including interpretations, predictions, and conclusions; and
- Criticizing, refining, and extending the newly-acquired knowledge by imagining other uses of the information or counter-examples to the arguments.

Resnick (1987) sums up much of the research on reading as a higher order skill. She says that "the analysis of reading comprehension as a meaning-imposing process that depends on the reader's knowledge of text structure as well as linguistic, topical, and inferential knowledge is common to all current cognitive theories of reading." She says further that while important differences exist among theories with respect to specific aspects of these processes—their timing, the kinds of cues that are necessary to call them up, and the ways in which knowledge is organized—there are no disagreements regarding the general characterization of comprehension. Resnick concludes that, based on the evidence, educators ought to aim to produce two kinds of reading comprehension abilities among students—the ability to understand written texts automatically and with little effort, and the capacity to apply deliberate strategies for interpreting and remembering when the need arises.

Recent work regarding the teaching of writing shows that it, too, is a complex cognitive process, embedded in a social context. Typically, writing instruction has emphasized the learning of isolated, frequently mechanical, skill components. This is so because the curriculum is grounded in a behavioristic psychology of learning that espouses hierarchies of separate skills, according to Resnick and Klopfer (1989).

Hull and Rose (1990) say that writing is more than stringing together separate skills but, rather, an activity in which various cognitive processes—planning, transcribing, and rewriting—are repeated. Writing thus is a problem-solving activity involving the writer in complex cognitive and linguistic processes such as organizing, structuring, and revising. Central to Hull and Rose's work is the concept that writing is socially constructed. This interpretation implies that educators must not only provide instruction about the processes of writing but also ensure opportunities to practice writing in all of its complexities and to become, in Hull and Rose's terms, enculturated into a "discourse community."

This view on writing has profound implications for the teaching of writing. Hull and Rose identify three maxims for writing instruction. The first is that learning to write requires tasks that are authentic and that are real instances of communication. The second maxim is that student writers can acquire new knowledge and skills through scaffolding which is provided by social interaction that encourages writers to stretch beyond their current capacity. The last maxim is to recognize that a writer's performance has a history and a logic. This recognition gives the teacher both a way to understand and investigate students' difficulties with writing and a means to identify appropriate instruction for particular students.

Hakuta (1990) explores the influence of evolving research in cognition and linguistics on second language acquisition and bilingual education. He traces complicated developments in psychology, linguistics and sociology and explains how they have influenced and shaped (and reshaped) our understanding of language acquisition. Based on his summary of research and theory of second language learning over the past 30 years he offers a set of conclusions which he believes are relevant to bilingual educators:

(1) The native language and the second language are complementary rather than mutually exclusive. Further, native language proficiency is a powerful predictor of the rapidity of second language development.

(2) The influence of the structural patterns of the native language on patterns of second language acquisition are minimal, especially at the level of grammar.

(3) Language proficiency is not unitary, but rather consists of a diverse collection of skills that are not necessarily correlated. Minimally, a distinction must be made between contextualized and decontextualized language skills. Contextualized, face-to-face conversational skills seems to develop more rapidly than decontextualized skills, although the latter is more important for academic success.

(4) The attainment of age-appropriate levels of performance in the second language can take four to seven years.

(5) Age may be a factor that constrains phonological and grammatical acquisition of a second language, but not the academic functions of language.

(6) Although affective factors are related to second language learning in some contexts, this is not applicable to immigrants learning English; indeed, the model is more applicable to the extent to which the native languages are maintained.

(7) Bilingualism is positively associated with greater cognitive flexibility and awareness of language.

(8) Skills transfer globally rather than piece by piece.

(9) Expertise in translation exists in all bilingual children, demonstrating considerable ability to transfer regardless of content.

The work of Michaels and O'Connor (1990) supports the idea of reading and writing as knowledge construction. They argue that a new definition of literacy must involve reasoning and problem-solving with print as socially-situated activities. They describe the need for teachers to understand and teach explicitly multiple discourses; that literacy is reasoning within multiple discourses.

Michaels and O'Connor devise three general implications for research, and educational policy and practice. Their points are sufficiently important to quote them at length:

Implication 1.

It is not enough just to expose students to a print rich environment, meaningful data, real-world problems, or even highly engaging hands-on experience. Teachers must be aware of and explicitly teach students a discourse. We do not mean merely teaching the superficial trappings of language, such as vocabulary, algorithms, or definitions of key concepts. Rather we mean teachers guiding students in the particular ways of thinking, giving explanations, constructing arguments, asking questions—specific to the domain in question. To do this teachers need to create appropriate discourse spaces that build on students' home-based ways of speaking and reasoning, as a bridge to new ones.

Implication 2.

The second point follows directly from the first. We need to look closely and critically at some of the current so-called "progressive" pedagogies, such as "whole language," and "process writing." These are programs in which teachers are encouraged to focus on meaning instead of form, to emphasize process over correctness of the product, and to make activities meaningful and relevant to children's everyday lives. These programs, in philosophy and pedagogy, encourage teachers to accept children's home-based ways of using language. In that sense, one might think that they were directly in line with what we are espousing. In many respects they are. But in one crucial sense, they are not. They do not offer specific guidelines for what conceptual and discursive skills teachers should teach, and by what criteria they should evaluate students' performance. In the absence of more objective criteria for what counts as a good text, or a good answer, teachers often work with discourse expectations that are personal and implicit, privileging those students who share the same set of interpretive strategies and discourse assumptions as the teacher. If you don't come to school already controlling elements of the discourse, it never gets unpackaged for you.

In a similar vein, we must evaluate carefully new educational curricula or technological tools that are designed specifically to enhance and promote higher order thinking. These tools are never context-neutral. They will inevitably be shaped by how teachers talk and how they allow students to talk. We need to look at the potential complexities new curricula will raise in multi-ethnic school settings, where they will be used with students from many, diverse discourse backgrounds.

Implication 3.

Our third point deals more specifically with teacher development and capacity building in the profession. In order for teachers to teach the discourses of school literacies, they too must begin to think broadly and critically about language, culture, and their relation to higher order thinking. As a central part of pre-service training, we need to make teachers more aware of importance and complexity of talk in the classroom. We are not just arguing for an extra course on "language" or "discourse analysis" to be inserted into teacher education programs. But more attention throughout the program could and should be given to classroom talk and its relation to higher order thinking. It is a broad and generative topic, with profound implications for the teaching of science and mathematics, as well as reading and writing.

Similarly, as a tool for in-service development, attention to classroom talk can be a powerful, transformative tool for getting experienced teachers to become more reflective on their own practice. If we are serious about improving schools so that they serve the many, not the few, there are not going to be any easy or inexpensive answers. We must invest in teachers. Rather than the teacher-proof curricula that we hear so much about, we need to think instead about developing curriculum-proof teachers. By this we mean teachers who can think analytically and critically about their role as orchestrators of classroom talk, and who can use these insights to make school-based literacies accessible to students of all backgrounds.

Mathematics

Mathematics for many adult Americans is a collection of methods of manipulating numbers, a pre-determined and rigid set of rules which govern calculation. The teaching of mathematics seems to parallel these beliefs, and takes the form of lecturing and listening. Students memorize formulas, learn "basics" that are decomposed from more complex problem-solving, and take tests that ask for and reward the correct, calculated answer.

Radically different from this view of mathematics is one in current research that describes mathematics as a science of patterns and order whose domain is numbers, chance, form, algorithms, and change. Mathematics produces theorems and theories, and requires distinctive, versatile and powerful modes of thought including modeling, optimization, logical analysis, inference from data, and the use of symbols.

Recent research in mathematics questions the notion that mathematics is somehow ahistorical; that it leapt fully formed from Euclid's brow to remain unchanged and unchangeable (Hoffman, 1990). Instead, greater emphasis on the social dimensions of mathematics shows that mathematics is culturally determined and reflects current values. This important insight about the nature of mathematics is exquisitely captured in an essay by Fasheh (1988) who shatters conceptions of mathematics as something fixed and removed from cultural contexts and, hence, requires the consideration of the ethics of mathematics.

The Mathematical Sciences Education Board (MSEB) in its report **Everybody Counts: A Report to the Nation on the Future of Mathematics Education** (1989) describes mathematic modes of thought. Such an approach is considerably different from the more traditional understanding that mathematics is only calculation. The MSEB lists the following mathematic modes of thought:

Modeling—Representing worldly phenomena by mental constructs, often visual or symbolic, that capture important and useful features.

Optimization—Finding the best solution (least expensive or most efficient) by asking "what if" and exploring all possibilities.

Symbolism—Extending natural language to symbolic representation of abstract concepts in an economical form that makes possible both communication and computation.

Inference—Reasoning from data, from premises, from graphs, from incomplete and inconsistent sources.

Abstraction—Singling out for special study certain properties common to many different phenomena.

Learning in mathematics is not simply the successful mastering of an immutable set of basic skills. Instead, students should go beyond the mastery of formalisms and construct mathematical meaning. The MSEB explains that skills are to mathematics what scales are to music and that the objective of all learning is to write, to play music, or to solve problems—not just to master the skills. Practice with skills is just one of many strategies used to help students achieve broader goals of learning.

Researchers offer evidence that students learn mathematics best when they construct their own mathematical understanding (Hoffman, 1990). In order to understand what they learn MSEB and others argue that they must *act*—they need to examine, represent, transform, solve, apply, prove, and communicate. Students enact these verbs of mathematics best when they work cooperatively in groups, engage in discussion, make presentations, and take charge of their own learning in other ways.

As educators struggle with reshaping and reconfiguring learning in mathematics, there are several resources available that provide thoughtful advice. In addition to the MSEB's publication, **Everybody Counts,** that same organization has produced **Reshaping School Mathematics: A Philosophy and Framework for Curriculum** (1990). The National Council of Teachers of Mathematics has prepared **Curriculum and Evaluation Standards for School Mathematics (1989)**.

In **Everybody Counts,** the MSEB identifies seven transitions through which mathematics education has begun to move. By no means are all schools—or even most schools—well along in these transitions. Many schools have not even begun to move along these dimensions. But it is increasingly clear that all schools must force these transitions if mathematics is going to be taught in ways that foster thinking. MSEB's seven transitions include:

- The focus of school mathematics is shifting from a dualistic mission—minimal mathematics for the majority, advanced mathematics for a few—to mathematics programs built upon a significant common core of mathematics for all students.
- The teaching of mathematics is shifting from an authoritarian model based on "transmission of knowledge" to a student-centered practice featuring "stimulation of learning."
- Public attitudes about mathematics are shifting from indifference and hostility to recognition of the important role that mathematics plays in today's society.
- The teaching of mathematics is shifting from preoccupation with inculcating routine skills to developing broad-based mathematical power.
- The teaching of mathematics is shifting from emphasis on tools for future courses to greater emphasis on topics that are relevant to students present and future needs.
- The teaching of mathematics is shifting from primary emphasis on paper-and-pencil calculations to full use of calculators and computers.
- The public perception of mathematics is shifting from that of a fixed body of arbitrary rules to a vigorous active science of patterns.

Fundamental changes are necessary in adult understanding of what mathematics is, in the structure and content of mathematics curriculum, in the relationship of student and teacher, and in mathematics assessment if school are to restructure the teaching of mathematics in ways that support higher order learning.

Science

Science education typically suffers from the same ailments as mathematics instruction described above. Science instruction—in biology, chemistry, physics, and earth science, as well as general science—all too frequently emphasizes memorization of an enormous number of terms and definitions, taxonomies, and discrete, unconnected "facts" regarding particular aspects of scientific work, laws, and formulas.

In sharp contrast, again, to this more reified approach to science, cognitive researchers and scientists together call for a kind of science education that focuses on three major goals that helps all students: construct a cogent view of the world as illuminated by science; gain an understanding of what the scientific endeavor is and how it relates to their culture and their lives; and develop scientific habits of mind. (AAAS, 1989).

Rutherford (1990) argues in favor of such an approach. He says that instead of rote memorization of unconnected facts, students need to acquire the kind of knowledge that focuses on understanding nature and the human presence in nature rather than on understanding the disciplines. He suggests that such knowledge should be integrative in several ways; that it should draw on concepts and principles as needed from the full panoply of the natural and social sciences, mathematics, and the applied science. He says that scientific knowledge should place emphasis on the connections among scientific ideas and processes, and it should meld an understanding of any particular scientific conclusion with the method by which that conclusion was produced.

The American Association for the Advancement of Science (AAAS) has produced a formidable work **Science for All Americans**. (1989). This document (actually a set of documents) provides an extremely detailed discussion of what science is, what scientific needs exist, what students should know and be able to do (how they might develop scientific habits of mind), what appropriate science instruction should be, and a blueprint for supporting such change. **Science for All Americans** describes the attitudes and skills that, together, make up scientific habits of mind:

- Respect of the use of evidence and logical reasoning in making arguments, curiosity about and openness to new ideas, and skepticism in evaluating claims.
- Computational skills, including the ability to make certain mental calculations quickly and accurately, to use electronic calculators, and to estimate answers when appropriate and to check on the reasonableness of other computations.
- Manipulation and observation skills, with emphasis on measurement, the use of computers for storing and retrieving information, the use of ordinary hand tools.
- Communication skills, including the ability to express basic ideas, instructions, and information clearly both orally and in writing, to organize information in tables and simple graphs, and to draw rough diagrams.
- Critical-response skills that prepare them to judge the assertions—especially those that evoke the mantle of science—made by advertisers, organizations, public figures, and the news media. (AAAS, 1989).

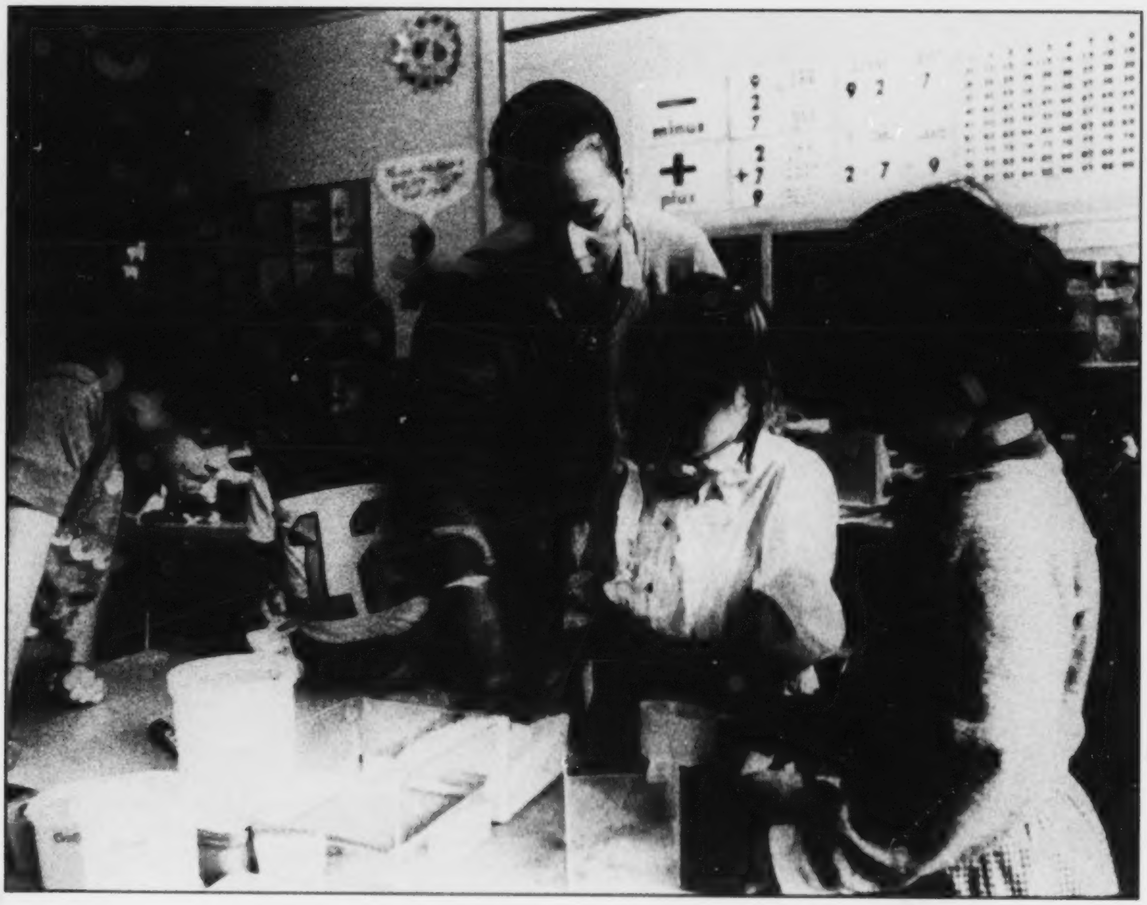
As in the case of both language and mathematics instruction, in order for science instruction to help all students develop such scientific habits of mind, current practice must change in a basic and fundamental fashion. The goals of science instruction described above simply cannot be accomplished with teaching as it currently exists in most schools.

Social Studies

In many ways a discussion about current practice in social studies instruction and its relationship to teaching for higher order learning will produce the same sort of litany of problems and misdirected efforts as outlined in the sections above dealing with language, mathematics and science instruction. In some ways the recommendations for improving the instruction of social studies will also mirror the earlier discussion. Solutions in these cases most often reflect not only new findings in cognitive science, but those findings coupled with what is already known to be good teaching. Hence, it should not come as a surprise that many of the recommendations cross subject areas.

While these similarities exist, there are also ways of learning—and discourses—within each subject that remain indigenous to that domain. Within the discipline of social studies are the study of sociocultural systems, communication, geography (human/environment interactions), economics, domestic and international politics, and history (social change and continuity). As knowledge within each of these disciplines grows it becomes physically impossible—if it ever was desirable—to teach the collection of facts that are frequently ascribed to each discipline. Instead, social studies should assist students to understand and make sense of their immediate world while at the same time help directly prepare students for living in the adult world of family, community, nation and world; of work, politics, environment and technology.

The fundamental basis of this preparation for living, however, must be an ethical one. "In the beginning and in the end, the social and behavioral sciences must inform questions of good and evil" writes the authors of the AAAS (1989) report on social and behavioral sciences. As in language where one does not teach only about reading comprehension but also encourages students to wrestle with meaning, or in science where one does not teach only scientific concepts but permits students to experiment and explore possible outcomes—social studies must not teach only about discrete social phenomena, but assist students to engage in critical social analysis, to pursue historical research with a clear purpose, to participate in democratic social practices, and to learn the content of social studies in ways that empower students to take thoughtful, principled social action.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E. Teachers' Role in Supporting Higher Order Learning for All Students

How knowledge and information are presented, how learning is managed, how exchanges occur in the classroom, and how students receive feedback to their responses and their actions all influence the quality of learning in school. The role of the teacher in this process is critical. This, of course, is not new, but if schools are to assume the new responsibility of ensuring higher order learning for all students, then the traditional role of the teacher must change.

Mediation as Questioning

Still crucial to the learning process, the teacher in this new setting that emphasizes higher order learning is no longer the sole possessor of knowledge who drills students in order for them to retain discrete pieces of information. Instead, the role of the teacher needs to become one of mediator of learning (Brown and Campione, 1990; Costa, 1985; Presseisen, 1988). Researchers who have studied the successful teaching of thinking describe the actions of teachers in those settings as mediation. The notion of teacher as mediator stresses two responsibilities of the teacher. The first involves the presentation, development, cultivation and support of thinking skills. This is done typically, through a mixture of direct instruction regarding skills, modeling the use of the strategies, and questioning the students. The teacher's role of questioner and respondent to questions is an important aspect of classroom mediation. Wasserman (1987) suggests that some teacher responses can inhibit or even stop a student's thoughtful pursuit of an issue. Shade (1990) describes how cultural differences can have the same effect. Her work focuses specifically on African-American children. Gilligan (1990) examines the dynamic and frequently negative change in young adolescent girls' questioning and its relationship to their self-image.

Teachers can ask questions that are designed to elicit only short, descriptive answers that fail to engage students' thinking. Ideally, the teacher as questioner turns students' back onto their own ideas, helps raise the discussion to higher levels of cognitive reflection, and by doing so models the sorts of behaviors and skills representative of higher order thinking. Haywood (1986) suggests a series of questions and probes that teachers might use to enhance classroom mediation:

- What do you need to do next?
- Tell me how you did that?
- What do you think would happen if ______?
- When have you done something like this before?
- How would it feel if ______?
- Yes, that's right, but how did you know it was right?
- When is another time you need to ______?
- What do you think the problem is?
- Can you think of any other way we can do this?
- Why is this one better than that one?
- How can you find out?
- How is ______ different (like) ______?

This list is by no means exhaustive but merely illustrative of the sorts of direct questions that teachers might use with students. Teachers can also model the consideration of such questions when engaging in discussion with students. In this latter case, teachers would describe their own thinking related to a text or a problem in order to model the use of a set of strategies for students.

While the teacher is generally seen as the primary interrogator during initial learning, good teaching of thinking occurs in a social setting, and students need modeling of thinking skills not only by the teacher but by peers as well. Most important, as noted earlier by Resnick, is the creation of a social community that shapes and supports a disposition for thinking.

This is the second aspect of teacher as mediator—creator of a supportive social setting. Skilled thinkers (often the teacher, but sometimes students) can demonstrate useful ways of attacking problems, analyzing texts, or constructing arguments. Palinscar and Brown (1984) describe the process where students work together on complicated performances as "scaffolding." Scaffolding permits each student to do part of the task and, by working cooperatively, the group can arrive at solutions that a single student could not manage alone. Mutual criticism and new ideas shared during the completion of the task help refine individuals' knowledge and skills.

Mediation Through Supportive Social Environment

Resnick and Klopfer (1989) add that while scaffolding and cooperative learning are important for expanding the knowledge and skills of students, the role of the social setting has an even more important function. The social community of the classroom may let students know that all the elements of critical thought—interpretation, questioning, trying possibilities, demanding rational justifications—are socially valued.

This notion of a supportive social setting draws from the work of Vygotsky (1962) and Feuerstein (1980) both of whom stress the importance of the learner's experience as influenced by linguistic exchange and by intervention of the classroom teacher. Feuerstein stresses the importance of classroom communication patterns (Presseisen, 1988). He says that by communicating in a variety of ways the teacher conveys three important aspects of mediation: **intentionality** (engages the learner in perceiving, registering, or performing); **anticipation** (takes the student beyond the immediate to learn to deal with consequences of thought and action in the future); and **meaning** (gets at the heart of understanding and comprehension).

Vygotsky writes of the child's "zone of proximal development"—the potential that children have for learning based on their personal experience, but that is separate from development itself (Presseisen, 1988). Vygotsky maintains that by carefully observing what every learner does, the teacher builds an index of those developmental functions which the students are in the process of cultivating in themselves. He describes the zone of proximal development as "...the distance between the actual developmental level as determined by individual problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978). The import point related to the role of the teacher and Vygotsky's ideas is that, given a particular problem-solving task, the zone of proximal development is identified by those parts of the problem-solving act that are beyond the ability of a person to carry out independently, but that a person is capable of carrying out with sufficient assistance from a teacher or more capable other (Presseisen, 1988). Hence it is incumbent upon the teacher to create and sustain the conditions in the classroom where students have sufficient access to "more capable others"—to the teacher or to their peers who through constructive and cooperative interaction can create a supportive social setting for higher order learning.

One example of a technique that has the potential to help create a supportive social community for thinking is reciprocal teaching. In theory, reciprocal teaching is a method of fostering reading comprehension that is modeled after studies of Socratic or inquiry teaching, and theories about plausible reasoning, explanation and analogy in understanding (Brown and Campione, 1990). In more practical terms, reciprocal teaching is a procedure that features guided practice in applying simple, concrete strategies to the comprehension of text. An adult teacher and a group of students *take turns* leading the discussion about the text (which participants read silently or the teacher reads aloud, depending on the reading skills of the group). The learning leader (adult or child) begins the discussion with a question and ends the session with a summary of what has been learned. When confronted with disagreement or misunderstanding, the group refers to the text and continues discussion until they reach consensus.

Brown and Campione identify three reasons for using reciprocal teaching. First, the strategies (questioning, clarifying, summarizing, and predicting) serve as very useful cognitive monitoring devices (e.g., if one cannot summarize the reading, this is a sound indication that understanding is not proceeding smoothly and corrective action is necessary). Second, the cooperative nature of the learning group—where all seek consensus regarding meaning, relevance, and importance—allows novices to practice their emergent comprehension skills. Reciprocal teaching thus creates Vygotsky's zone of proximal development because the group's efforts are externalized in the form of a discussion and novices can learn from the contribution of those more expert, and can share in the co-construction of meaning to the extent that they are able. The third rationale for using reciprocal learning is the several roles that it requires of the teacher. The teacher must:

- Model expert behavior;
- Monitor the group's understanding;
- Engage in on-line diagnosis of emerging competence;
- Push for deeper understanding;
- Scaffold the weaker students' emerging competence; and
- Fade into the background whenever the students are able to take charge of their own learning. (Brown and Campione, 1990).

Reciprocal teaching thus serves as a good example of an approach that attempts to incorporate the research on cognition and higher order learning, knowledge in learning (see: Brown and Campione's detailed description of and justification for the development of their biology curriculum), and the development of a disposition for thinking.

Resnick and Klopfer (1989) consider the role of the social setting in support of thinking a critical one and comment, "...we can expect intellectual dispositions to arise from long-term participation in social communities that establish expectations for certain kinds of behavior. Through participation in social communities, students would come to expect thinking all the time, to view themselves as able, even obligated to engage in critical analysis and problem-solving." They say that this approach serves as another argument for subject matter to be taught as occasions for thought, elaboration, and interpretation throughout schooling.

The actions of the teacher in constructing supportive social relations serves to create a setting that both legitimates and encourages thinking. Hence as a mediator of learning and thinking, the teacher must successfully fulfill dual roles—questioner and creator of a supportive social setting. Teachers in this new role need to allow and encourage students to think; to develop their own "theories" and interpretations, and to do so with other students. Teachers mediate several constellations of activities simultaneously. They should mediate (as opposed to control) the relationship between student and knowledge, the relationship between student and student as they work together to generate new knowledge, and the relationship between student and the larger world (i.e., the immediate world of limiting personal and social problems and the more expansive world where the student must function as an adult.)

Obviously, typical current teacher training—both pre-service and in-service training—does not provide teachers with adequate preparation and training to implement successfully classroom interaction where they function as a mediator of learning and thinking. Significant attention and resources need to be directed to the goal of high quality professional development aimed at giving teachers the requisite knowledge, skills, and structure (e.g., flexibility of instructional time, sufficient time for cooperative planning) for them to be able to take on the role of a skilled mediator.

F. Student Assessment That Supports Thinking

A critical factor in the effort to improve the teaching of thinking in schools is the method of assessment used to determine the efficacy of teaching and student learning. It is widely believed by both researchers and educational practitioners that the examination system is a major determinant of what is taught, how it is taught and how students go about learning.

Marzano and his colleagues (1988) cite research on academic work in American schools which reveals that what is assessed and how it is assessed drives both the curriculum and the tasks presented to students in the classroom. As a result, students (and teachers and administrators) tend to take seriously only those tasks that they are held accountable for in testing.

In many states and local districts mandated tests have profound effects not only on the education of students but also on the resources provided for instruction, educators' recognition and standing (sometimes their jobs), as well as secondary effects on property values. Testing is frequently a high-stakes enterprise.

During the 1980's a large number of states undertook educational reforms that involved raising educational standards and increased accountability of educators as measured by standardized tests. As the demand increases for improvements in the teaching of higher order skills, fundamental questions must be asked about the role of assessment and its support or hindrance of this goal. Does current testing have deliterious effects on efforts to support higher order learning?

Resnick and Resnick (1989) insist that before any questions about the efficacy of testing and the importance of the mismatch of current testing with improved thinking can be answered, one must differentiate among the several functions of testing. They have identified three main classes of educational testing:

1. Public accountability and program evaluation;
2. Student selection and certification; and
3. Instructional management and monitoring.

They maintain that the interplay between tests results and curriculum and instruction differ in each. It is useful for this discussion to examine these differences.

Public accountability assessments

The first function of testing identified by the Resnicks is public accountability and program evaluation. As its name suggests assessment for public accountability should allow those in positions of public oversight to monitor and evaluate the performance of the school system. Program evaluation assessments function as a subset of public accountability assessments. The primary audience for both assessments is some distance removed from the classroom because it requires a dispassionate evaluation of the system, not necessarily an accounting of outcomes of individual students. Typically, accountability assessments are expected to operate detached from teacher control but in close relationship to the curriculum in order to provide an impartial judgement of student performance. As noted earlier, educators tend to direct their teaching in ways that they believe will raise test scores. The Resnicks note that those designing and adopting accountability assessment instruments—precisely because of the influence these tests have on teaching—have a responsibility to consider the sorts of instructional practices their tests will drive, and the kinds of messages about the goals of education the tests convey either implicitly or explicitly.

Selection and certification assessments

The selection and certification of students is the second function of assessments. In this instance testing is designed to assist in student selection for entrance into educational programs or post-secondary institutions. Selection assessments focus on providing information about individual student performance. Because the outcomes of these tests can substantially influence future schooling, serious concerns exist regarding the possibility of systematic bias against any groups of students. The SAT and ACT examinations are this country's dominant example of selection tests. While these exams are considered not directly related to the curriculum, selection examinations in other counties typically are tied directly to the curriculum. In this latter sense, examinations such as the British Public Examinations and the French Baccalaureate function to certify the successful completion of a course of study as well as a demonstrated level of competence related to that course.

In the United States, the New York Regents program is an example of an examination system.

Like accountability assessments, selection and certification tests should be impartial, their primary audience is some distance from the classroom, and both serve very public functions. In the instance of student selection, the selection itself is accomplished, ideally by comparison of student performance across schools on a common standard.

Instructional management and monitoring assessments

The third function of assessments noted by Resnick and Resnick has to do with instructional management and monitoring. This function differs markedly from the first two. Testing in this case focuses explicitly on the day-to-day work within the classroom and serves to monitor instruction—the effectiveness of specific lessons or student groupings and diagnosis of students' strengths and weaknesses. The aim here is not to provide information for programmatic or professional evaluation but instead, to provide teachers and administrators with rapid cues to help shape instruction. The judgement of the students' own teachers can serve as part of the assessment, unlike in the two functions noted earlier where detached, disinterested judgements were necessary. Here, tests must be tied closely to the curriculum in order to identify the problem-solving and reasoning processes with which students need greatest help.

Of these three functions of assessment, the one that has received the most systematic scrutiny is selection testing (Widgor and Garner, 1982). Despite the high level of scrutiny regarding selection, little has been written in the United States favoring a certification exam. Resnick (1990) argues for an examination similar to the British model but with greater flexibility. The examination—as opposed to a test—would be something that students study for, is graded externally, and encourages coaching by teachers. Tucker (1990) also calls for such an examination but with an eye towards preparation for employment. Both writers offer useful suggestions for the content, design or range of such an examination system and their work deserves careful consideration by educators.

States have particular influence regarding the design and use of accountability assessments. Because state education reform efforts attempt to use assessment to lever change in educational practice, these tests need serious attention.

Accountability Assessments

Accountability tests, regardless of their form or frequency—to the extent they are made public and have consequences—tend to shape teacher practice. This is so despite rhetoric of curriculum neutrality. The Resnicks explain that if tests are recognized as guiding or constraining the curriculum, they become problematic with the American educational ideology that asserts local control. Hence educators are frequently criticized for "teaching to the test."

In contradiction to the rhetoric of curriculum neutrality, teachers and principals are strongly motivated to produce test scores within an acceptable range because of publicity surrounding the scores. The power of assessments over teachers' and administrators' practice is precisely what makes them such potent tools for educational reform. It is the intention of state education agencies and legislatures to influence both what is taught and what are considered as acceptable educational standards. That is the nature of imposing public accountability. Ideally, tests are introduced, not to serve as neutral indicators of performance, but rather to upgrade (hopefully) teaching and learning.

Because there is no way to create accountability tests that will be curriculum-neutral, then it seems reasonable to assume that every test used for public accountability or program evaluation is an instrument that will affect the curriculum. The Resnicks agree with this assumption, and based on that assumption propose three principles to serve as guidelines for accountability assessment.

The first of their three principles is, **you get what you assess**. Because educators will teach to tests if tests matter in their or their students' lives, the tests must be carefully crafted to sample directly those educational practices and performances that are valued. The Resnicks point out as an example, "...if we put many multiple choice tests into the testing system, we must expect children to practice answering multiple choice questions—as required by so many of today's workbooks in every school subject. In contrast, if we put debates, discussions, essays, and problem solving into the testing system, children will spend time practicing those activities." (Resnick and Resnick, 1989).

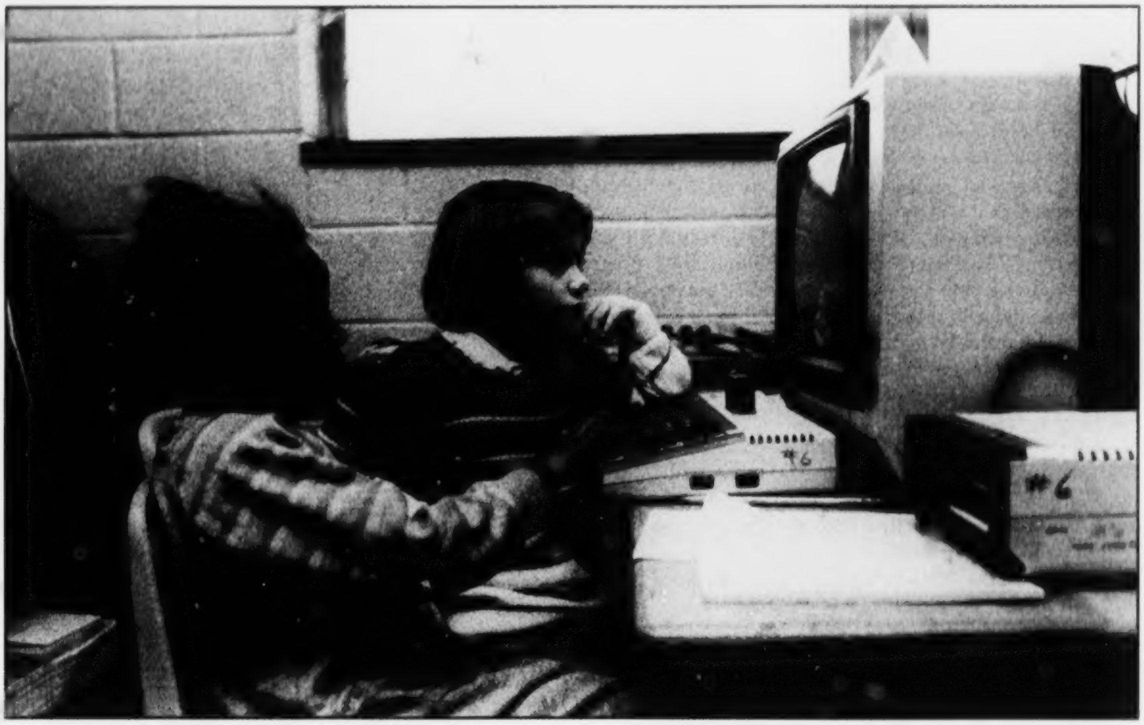
The second principle regarding accountability assessment—**you do not get what you do not assess**—suggests that what does not appear on the test tends to disappear from the classroom. Hence, if the goals of solving multiple-step mathematical problems, of using scientific methods, of writing extended essays, or applying critical judgement to complex social problems are educationally important then those activities need to appear directly in an assessment program. The Resnicks add that acceptance of this principle means that it is not sufficient to test the so-called "basics" assuming that teachers will prepare students for such tests and then move on to teach "higher order" abilities.

The third principle—**build assessments toward that which you want educators to teach**—couples the first two functions and is the basis for changing current assessment system. Assessments must be designed in ways that not only allow, but encourage teachers to prepare their students for the test—but for tests which exercise the kinds of abilities and develop the skills and knowledge that meet the description of higher order learning. Hence, what is contained in the assessment instrument will be practiced in the classroom and both should support the development of critical and other higher order thinking skills in all students.

Such an approach is examined in detail by Wiggins (1989) who builds a powerful argument for the use of "authentic" tests. He provides a useful set of propositions regarding test tasks, incentives for adopting authentic tests, and reaching and maintaining high standards. In addition, Wiggins sets out several recommendations for the design and implementation of authentic testing. He calls for the use of performance-based assessment where students would be required to conduct science experiments, write essays and develop portfolios of their work.

The use of performance-based assessment has grown rapidly by state and local school districts in the last ten years. The most widely-used form of this approach is writing assessment. Rothman (1990) reports that at least half the states have in place or are considering such tests in other subjects. The National Assessment of Educational Progress has included performance components in its 1990 tests and plans to expand their use in 1992. Despite some controversy regarding the reliability of such tests, the use of performance-based assessment continues to grow.

This research points to a fundamental question which should be posed for any assessment, "Is this what we want students to be doing with their educational time?" How one answers that question should determine the content and form of the assessment measures and instruments.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G. Examples of Specific Programs to Teach Thinking

Despite the significant and important findings from cognitive scientists identified in this report, there is not complete agreement among experts on all issues of cognition. Much careful research and rich debate needs to go forward. There is also no single imprimatur that identifies programs and approaches to improve student thinking as successful and officially accepted. Wide variety exists with regard to quality and effectiveness about program design and implementation as well as the quality of evaluation.

Researchers are generally in agreement that the most effective teaching of thinking occurs within subject areas. However, when that is in place, supplemental, discrete programs for teaching thinking not tied to subject areas can be very effective. This section of the report considers those specific programs. Sternberg (1985) set out guidelines for choosing programs that teach thinking skills. His guidelines include:

- The program should be based on a psychological theory of the intellectual process it seeks to train and an educational theory of the way in which the processes are to be taught;
- The program should be socioculturally appropriate;
- The program should provide explicit training both in the mental processes used in task performance and in self-management strategies for using these components;
- The program should be responsive to the motivational as well as the intellectual needs of the students;
- The program should be sensitive to individual differences;
- The program should provide explicit links between the training it provides and functioning in the real world;
- Adoption of the program should be based on demonstrated empirical success in situations similar to one's own;
- The program should have associated with it a well-tested curriculum for teacher training; and
- Expectations should be appropriate for what the program can accomplish.

Several researchers have reviewed programs designed to teach thinking skills to students. Useful reviews of such programs include: Nickerson, Perkins and Smith (1985); Chance (1986); Bransford, Sherwood, Vye and Rieser (1986); and Presseisen (1986). These publications provide helpful information on a large number of the programs that have been developed to teach thinking.

The Association for Supervision and Curriculum Development (ASCD) has long provided leadership in identifying research and programs related to improving thinking, and has published a substantial amount of material to facilitate the implementation of those advances. Of particular use is the book **Developing Minds: A Resource Book for Teaching Thinking** (1985) edited by Arthur L. Costa. It assembles a broad collection of essays regarding the teaching of thinking. One section of that book deals expressly with programs for teaching thinking. This report borrows from the ASCD book for the examples which follow. The following section has been reprinted with the permission of the Association for Supervision and Curriculum Development, copyright (c) 1985, all rights reserved. The examples below represent programs for teaching thinking that have been implemented in a variety of schools. This list is not exhaustive but notes the better-known programs. It omits, for example, other important programs like those developed by the Maryland Center for Thinking Studies. The first section lists those programs that have been cited by several prominent cognitive researchers as being effective. The second section includes popular programs also supported by evaluation research which may well be successful, but for which CCSSO staff did not find multiple endorsements.

The Council of Chief State School Officers lists the following programs as examples of potentially useful approaches to support improvements in student thinking. This list does not serve as an official endorsement but merely as an illustrative collection.

Section 1. Programs for Teaching Thinking Skills

CoRT (Cognitive Research Trust)

Developer:

Edward de Bono

Goal:

Teach thinking skills useful to everyone in and out of school.

Sample skills:

PNI: Positive, Negative, Interesting
CAF: Consider All Factors

Assumptions:

- Lateral thinking, unlike vertical thinking, is not necessarily sequential, is unpredictable, and is not constrained by convention.
- It is not necessary to be right at every stage of the thought process nor to have everything rigidly defined.
- Intelligent people are not necessarily skillful thinkers.

Intended audience:

Ages eight to 22, all ability levels.

Process:

Students practice "operations" following "lesson notes." Teachers present and monitor the exercises.

Time:

One lesson 35 minutes or longer per week for three years.

Comments:

Evaluation results suggest that the program leads students to take a broader view of formally posed problems.

Available from:

Pergamon Press, Inc.
Fairview Park
Elmsford, NY 10523

Higher-Order Thinking Skills (HOTS)

Developer:

Stanley Pogrow

Goal:

Use higher-order thinking activities to improve basic skills and social confidence, while also improving problem-solving ability.

Skills:

- Develop and test strategies for the solution of problems.
- Interpret computer-generated feedback as to the quality of strategies.
- Integrate and synthesize information from a variety of subjects to the solution of problems.
- Generalize ideas across content areas and computer environments.

Assumptions:

- Students in compensatory education programs can and should be challenged intellectually at a high level.
- The key to improving thinking ability is to increase the repertoire of strategies available to students and to increase the ability to develop sophisticated networks of associations between concepts.

Intended audience:

Chapter 1 students in grades 3-6; can be extended to average performing students in grades 3-6.

Process:

Students work in computer lab. Curriculum provided to lab teachers structures the problem-solving and linkage activities that in which students will engage. Work on computer is preceded by a discussion about thinking in which students articulate the consequences of their strategies and the teacher poses challenge questions for the students to work on.

Time:

Students receiving compensatory education have four lessons per week on a continuous basis, which replaces existing Chapter 1 services. Average performing students would attend lessons every other week.

Available from:

Stanley Pogrow
College of Education
University of Arizona
Tucson, AZ 85721

Instrumental Enrichment

Developer:

Reuven Feuerstein

Goal:

Develop thinking and problem-solving abilities in order to become an autonomous learner.

Sample skills:

Classification/comparison, orientation in space, recognizing relationships, following directions, planning, organizing, logical reasoning, inductive and deductive reasoning, synthesizing.

Assumptions:

- Intelligence is dynamic (modifiable), not static.
- Cognitive development requires direct intervention over time to build the mental processes for learning to learn.
- Cognitive development requires mediated learning experiences.

Intended audience:

Upper elementary, middle, and secondary levels.

Process:

Students complete paper-and-pencil "instruments," which are introduced by teachers and followed by discussions for insight to bring about transfer of learning. The teacher becomes the mediating agent. The cognitive tasks in the materials of instruction are not subject-specific but parallel the subject matter being taught by the teacher.

Time:

Two to three hours a week (plus bridging to subject matter and life skills) over a two-to three-year period.

Available from:

Curriculum Development Associations, Inc.
Suite 414, 1211 Connecticut Avenue, N.W.
Washington, DC 20036

ODYSSEY

Developers:

A team of researchers from Harvard University, Bolt Beranek and Newman Inc., and the Venezuelan Ministry of Education.

Goal:

Teach a broad range of general thinking skills.

Sample skills:

Careful observation, classification, precise use of language, analogical reasoning, hypothesis generation and testing, problem-solving strategies, and decision making.

Assumptions:

- Performance of intellectually demanding tasks is influenced by various types of factors: abilities, strategies, knowledge, and attitudes.
- Some, perhaps all, of these factors are modifiable.
- Teaching approach should ensure student participation and intellectual involvement.

Intended audience:

Middle level students.

Process:

Emphasis on student discussion and engagement in problem solving, reasoning, decision making, creative activities. Some paper-and-pencil exercises. Introspection on own thought processes.

Time:

Three to five 35-minute lessons per week.

Available from:

Mastery Education Corporation
85 Main Street
Watertown, MA 02172

Philosophy for Children

Developer:

Matthew Lipman

Goal:

Improve children's reasoning abilities by having them think about thinking as they discuss concepts of importance to them.

Sample skills:

Draw inferences, make analogies, form hypotheses, classify.

Assumptions:

- Children are by nature interested in philosophical issues such as truth, fairness, and personal identity.
- Children should learn to think for themselves, to explore alternatives to their own points of view, to consider evidence, to make careful distinctions, and to become aware of the objectives of the educational process.

Intended audience:

Students kindergarten through high school.

Process:

Students read special novels with inquisitive children as characters, followed by teacher-led discussion, using structured discussion plans, exercises, and games.

Time:

Three 40-minute periods per week.

Available from:

Institute for the Advancement of Philosophy for Children
Montclair State College
Upper Montclair, NJ 07043

Section 2. Additional Programs for Teaching Thinking Skills

BASICS

Developers:

Sydelle Seiger-Ehrenberg and Lyle M. Ehrenberg (based on original work by Hilda Taba)

General goal:

Students use appropriate thinking strategies to achieve five major types of learning objectives of curriculum: facts, concepts, principles, attitudes, and skills. They apply these thinking strategies in dealing with outside-of-school learning and life situations.

Sample skills:

Observing, retrieving, comparing, contrasting, grouping, concept formation, classifying, inferring, generalizing, anticipating, making choices, attitude formation, skill development.

Assumptions:

- Practice of thinking skills out of context is not likely to result in consistent use of appropriate thinking in learning and life situations.
- Achievement of curriculum learning objectives and transfer to life situations is most likely to occur if students have consistent practice in the use of appropriate thinking as they learn.
- All curriculum objectives, regardless of specific content, can be classified by the type of learning (and thinking) required of students.
- Thinking strategies can be incorporated into any curriculum so that students not only achieve the objectives better and faster but also learn strategies for learning, problem solving, and planning.
- Short of building or revising curriculum to incorporate appropriate thinking strategies, teachers can be trained to build such strategies into their teaching of the existing curriculum.

Intended audience:

Suitable for preschool through adult learners.

Process:

- In the **curriculum model** curriculum is developed or revised to include thinking strategies as the process for achieving the learning objectives.
- In the **staff development model** teachers are trained to plan and conduct lessons that incorporate the use of appropriate thinking strategies.

Time:

- The curriculum model is developed and implemented in a three-to five-year process that includes periodic training and follow-up as curriculum is written and tested.
- The staff development model requires a minimum of 15 to 20 full days of training over a two-year period with one-year periodic follow-up.

Available from:

ICI Services, Ltd.
301 South Third Street
Coshocton, OH 43812

Creative Problem Solving (CPS)

Developer:

Sidney J. Parnes (based on work by Alex F. Osborn)

Goals:

Develop abilities and attitudes necessary for creative learning, problem sensing, and problem solving.

Sample skills:

Set goals and objectives; sense problems, challenges, and opportunities; search out data; define and analyze problems; generate ideas; discern criteria for effective evaluation; develop and implement solutions; develop feedback systems; plan and gaining acceptance; anticipate new challenges from actions taken.

Assumptions:

- Creativity involves the application of knowledge, imagination, and judgment to learning, problem sensing, and problem solving.
- Everyone has the capacity, at their own mental level, for using creative approaches to learning, problem sensing, and problem solving.
- Continuing practice in using these approaches leads to ever-increasing proficiency.
- CPS processes should be taught deliberately, both as general thinking skills and as applications to learning within all subject matter areas.

Intended audience:

Middle (especially for the gifted) and secondary levels (all). (Lower level materials based on CPS available from D.O.K. Publishers, Buffalo, N.Y.)

Process:

Under direction of the teacher students use activity book for practice exercises to strengthen CPS processes. The teacher's guidebook offers additional exercises, readings, film listings, bibliographic sources, and test sources. Alternatively, students do independent self-or group-study and practice with specially designed texts. Transfer of learning is emphasized in all materials.

Time:

A variety of flexible time patterns are suggested in the teacher's guide. Material is programmed for instruction blocks of approximately one hour. Plans are suggested for programs as short as eight hours or as long as two years. Programs are based on extensive research and field testing.

Available from:

Creative Education Foundation
437 Franklin Street
Buffalo, NY 14202

Future Problem Solving

Developer:

E. Paul Torrance (based on the work of Alex Osborn and Sidney Parnes)

Goals:

Develop creative problem-solving skills while learning about the future.

Sample skills:

Creative problem-solving process, communication skills (verbal and written), teamwork skills, research techniques, critical and analytical thinking.

Assumptions:

- Problem-solving skills are necessary to function effectively.
- In order to prepare for the future, young people need to consider issues related to that future.
- Students can and should be taught to think more creatively.

Intended audience:

Regular program: grades 4-12. Primary division: K-3.

Process:

Students in teams of four follow a multiple step problem-solving process: gathering information about a topic, brainstorming problems from a given situation, identifying the major underlying problem, brainstorming solutions, selecting criteria by which to evaluate solutions, and evaluating the solutions to determine the best one.

Time:

Varies with individual schedules; one hour per week is normal.

Available from:

Future Problem Solving Program
Coe College
Cedar Rapids, IA 52402

Guided Design

Developer:
Charles E. Wales

Goal:
Teach students the decision-making process and how to apply the subject matter they learn.

Sample skills:
Identify and solve open-ended problems; think critically; generate, classify, and explore alternatives; develop analogies; analyze issues; find the causes of problems; make careful distinctions; anticipate potential problems; and deal with issues of truth, fairness, and different viewpoints.

Assumptions:
Knowledge is a means, not an end; a necessary but insufficient tool for success after graduation. It is the ability to apply knowledge that is crucial.

Intended audience:
Upper elementary through college and adult learners.

Process:
The "complete" decision-making process is modeled step by step in slow motion using printed instruction-feedback materials. Students use current subject matter as they make decisions. The teacher is a mediator and manager.

Time:
Varies. There should be regular practice in at least one course at every level each term.

Available from:
The Center for Guided Design
Engineering Sciences Building
West Virginia University
Morgantown, WV 26506-6101

Learning to Learn

Developers:
Marcia Heiman and Joshua Slomianko

Goals:
Improve students' academic performance in content areas across the curriculum; and improve students' skills in reasoning, reading, writing, and listening.

Sample skills:
Generating questions from notes, books, handouts; constructing information maps and flow charts; reading for examples; reading to solve problems; using an editing checklist for math problem solving and written composition; systematic problem solving.

Assumptions:
All successful learning has the following elements. The learner is:

- Generating questions, raising and testing hypotheses.
- Breaking down complex tasks and ideas into manageable components.
- Devising informal feedback mechanisms to assess progress toward goals.
- Directed toward achieving specific goals.

Intended audience:
Junior and senior high school students.

Process:
In junior and senior high school, content area teachers incorporate LTL activities into classroom and homework assignments. In senior high, students take a year-long course in which they adapt the LTL skills to all their content area courses, learn the principles underlying LTL, and devise LTL exercises based on these principles.

Time:
No extra time when LTL is part of classroom instruction since the method helps students master the content material in an efficient way. A year-long course at senior high level.

Available from:
Learning Skills Consultants
Box 493
Cambridge, MA 02138

Project IMPACT

Developer:

S. Lee Winocur

Goals:

Improve students' performance in mathematics and language arts by facilitating their acquisition of higher-level thinking skills.

Sample skills:

Classifying and categorizing, ordering, identifying relevant and irrelevant information, formulating valid inductive and deductive arguments, rendering judgments.

Assumptions:

- All students are capable of higher-level thinking.
- Thinking skills can be taught.
- Thinking skills can be learned.
- Thinking skills are basic to the learning process.
- Thinking is best introduced in a social context.
- Thinking skills must be related to the curriculum.

Intended audience:

Middle and secondary levels.

Process:

Students' basic skills in language arts and mathematics improve through learning activities that include a critical thinking component infused into content area lessons through (1) a sequential and cumulative universe of critical thinking skills designed to help students reason, (2) a model lesson format, and (3) ten teaching behaviors that label and reinforce students' use of thinking in an interactive environment.

Time:

Two to three hours per week.

Available from:

S. Lee Winocur
National Director
Project IMPACT
Orange County Department of Education
P.O. Box 9050
Costa Mesa, CA 92628-9050

Strategic Reasoning

Developer:

John Glade (based on Albert Upton's "Design for Thinking" model.)

Goal:

Teach the conscious thinking skills students must have to function effectively in school and in real life.

Skills:

Thing-making (identification)
Qualification (description)
Classification (organization)
Structure Analysis (part-whole relations)
Operation Analysis (sequencing)
Seeing Analogies

Assumptions:

- Six thinking skills form the fundamental core of all thinking and problem solving.
- Instruction in the six thinking skills improves both school and real-life performance and success.
- Thinking instruction must be integrated with, not separated from, regular classroom learning.

Intended audience:

All students from the 4th grade up.

Process:

Students do group activities and paper-and-pencil exercises. Teachers lead discussions of problem-solving processes and rationales. Program materials provide for transition from developmental IQ-type exercises to subject-matter exercises, then to life applications.

Time:

One period per week.

Available from:

Innovative Science, Inc.
Park Square Station
P.O. Box 15129
Stamford, CT 06901-0129

Structure of the Intellect (SOI)

Developer:

Mary Meeker (based on Guilford)

Goal:

Equip students with the necessary intellectual skills to learn subject matter and critical thinking.

Sample skill:

NMI: coNvergent production of
seMantic Implications (choosing the best word)

Assumptions:

- Intelligence consists of 120 thinking abilities that are a combination of operations (such as comprehending, remembering, and analyzing); contents (such as words, forms, and symbols); and products (such as single units, groups, relationships).
- Twenty-six of these factors are especially relevant to success in school.
- Individual differences in these factors can be assessed with the SOI-LA tests and improved with specifically designed S0I materials.

Intended audience:

All students and adults.

Process:

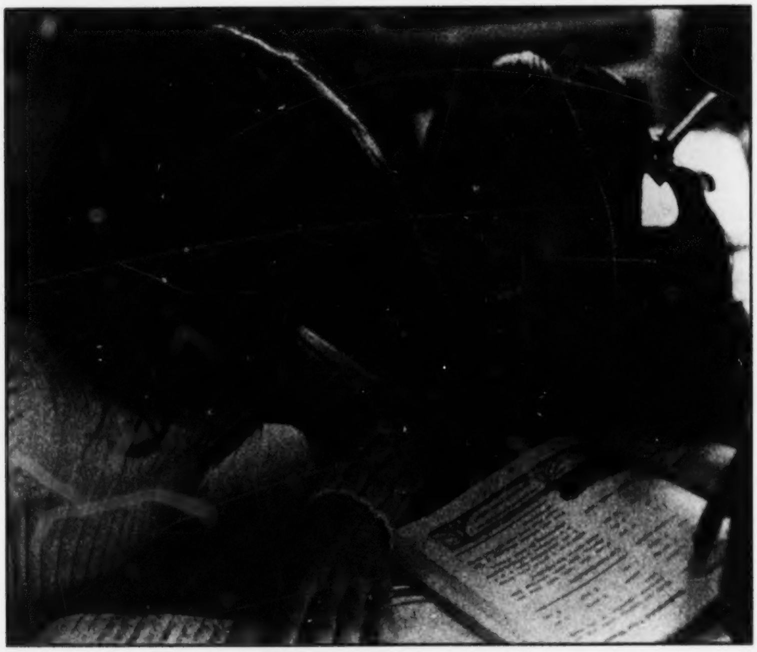
Students use materials (some three dimensional) prescribed for them based on a diagnostic test. Computer software gives analyses and prescriptions.

Time:

Varies, but can be 30-minute lessons twice a week until abilities are developed on post-assessment.

Available from:

S0I Institute
343 Richmond Street
El Segundo, CA 90245



H. Conclusion

The purpose of this first section of the report has been to review current research in the cognitive and related sciences regarding the nature of thinking and examine how these advances can inform improvements in teaching critical and other higher order thinking to *all* students. This report serves as a bridge between research findings and education policymakers and practitioners.

The review of research on thinking in this report has identified several controversies and disagreements among researchers regarding the implementation of research findings but found fundamental agreement among a broad array of researchers on several important points.

The first and most fundamental point of agreement is that *all* students—with the exception of very few students with severe mental disabilities—are capable of higher order thinking and reasoning. All students, even young children, can and do think, reason and problem-solve in sophisticated ways. What differs is not thinking ability among students, but the quality of instruction provided aimed at supporting higher order learning. Because schooling for disadvantaged students typically lacks a commitment to higher order learning, special efforts need to be made and, in many instances, additional resources must be directed by state and local education agencies to ensure the provision of the requisite pedagogical and social supports to develop fully thinking and reasoning skills. Issues of educational quality and equity are inseparable in these instances. Remedial education should not emphasize "basic skills" instruction to the exclusion of thinking and problem-solving but should, instead, provide varied instructional approaches that support and encourage higher order learning. Too few schools have made such changes.

A second point of agreement has to do with what and how thinking skills are taught. The teaching of thinking and reasoning is most effective when instruction is based in subject areas of the curriculum. When this is accomplished, use of additional programs that focus solely on thinking skills has proven helpful, but the major emphasis should be on teaching thinking within the academic disciplines. Caution is necessary to prevent "thinking" from becoming taught as its own subject discipline, separated and reified from the content of the rest of the curriculum. Thinking is not an abstract set of skills but deeply rooted in social and subjective contexts. Significant progress remains to be made in this area. Typically, educational practice does not encourage or support higher order thinking for all students, or even for most students. Fundamental changes in instruction are necessary for the successful restructuring of learning to occur.

Third, if teachers are to become mediators of learning as described in this report, their role must change significantly. Realistically, this shift cannot take place without substantial, high quality staff development. Teacher training—both pre-service and in-service—needs fundamental reworking. Staff development and teacher preparation as they presently operate are woefully inadequate and frequently inappropriate as training to support and foster student thinking. Radical changes—nothing less—are absolutely necessary in all aspects of training. Significant critical review of current practices and substantial new resources to support necessary changes in professional development are imperative if teachers are to be adequately prepared to work effectively. In places where this concern is not taken seriously, there is little hope of major improvements in instruction, and serious questions raised about the commitment of policymakers.

Fourth, and closely aligned to changes in professional development, are necessary changes in student assessment to emphasize thinking, problem-solving, and rich performance. While several states have made impressive advances in improving student assessments, much work remains in the effort to design assessment systems that by testing student performance, reasoning and judgement, encourage teaching that fosters these same characteristics.

Additional concerns remain regarding improved student learning apart from research literature on cognition. One concern emphasizes the need to ensure that efforts to enhance student thinking and reasoning are useful not only for those students who plan to attend college but for the many students who enter the workforce immediately or shortly after high school. Special emphasis on ensuring effective, higher order learning is necessary for these latter students who will face family, workforce and citizenship responsibilities in different ways than their peers who continue on into higher education. Historically, schools have not provided an education of higher literacy to these students and at present few schools are prepared to provide such an education. This must change.

Secondly, greater effort is necessary to use research on second language acquisition to drive improvements in the schooling of language minority students. Despite decades of research on issues related to bilingual education, large numbers of language minority students continue to be ill-served in American classrooms.

All children deserve—and, with the social and labor requirements of this decade and the new century, need—an education that fosters and develops thoughtful and critical analysis, cooperative problem-solving, persistence and a disposition for thinking, and encourages civic action based on justice and ethical consideration. Our hope is that this report serves to assist educators and policymakers ensure such an education for *all* students in the United States.

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PART II

STATE CRITICAL THINKING INITIATIVES: RESULTS OF A SURVEY BY CCSSO

A. Introduction

The high school diploma, among other things, must represent attainment of high standards—mastery of essential skills; . . . thoughtful application of knowledge and skills to problems as a worker, family member and citizen . . .

—CCSSO Policy Statement
on Restructuring Schools

The purpose of the Council's report on higher order learning is to link research findings in the cognitive and social sciences regarding thinking and reasoning with educational policymakers and practitioners and so serve to improve teaching and learning of *all* students. One way to cement that link is to identify current state policies, practices, and initiatives that attempt to implement those research findings and to restructure learning. Thus education decisionmakers can learn from other states' efforts which focus on improving student thinking and reasoning. As one of several of its activities to support the restructuring of learning, in the spring of 1990 the Council of Chief State School Officers surveyed the 50 states, the District of Columbia, the extra state jurisdictions and the Department of Defense Dependents Schools regarding state critical thinking initiatives.

The primary objective of the survey was to acquire base line data on activities by the states to promote the teaching of critical and other higher order thinking skills. Part II of this report describes the survey design and methodology, reports findings on state initiatives, and offers conclusions on the information provided by the states. Additionally, Part II provides a status report and data about the types and elements of state critical thinking initiatives and documentation of promising state programs. These state initiatives are described systematically in state-by-state charts found in Appendix II.

The charts in Appendix II contain information from state responses to the CCSSO questionnaire, State Critical Thinking Initiatives. The data is displayed in two sets of tables. The first section of charts describes state critical thinking initiatives aimed at the general student population (this includes programs for gifted and talented students). The second set of charts describes state critical thinking initiatives which specifically target special needs students. Some overlap across these two categories occurs. Also, some states reported implementation of more than one critical thinking initiative.

The data table for students enrolled in the regular school program is categorized using seven columns with the following headings: State/Type; Summary; Funding; Impetus; Goals; Implement; and Middle. The "State/Type" column identifies the state name and the type of critical thinking initiative(s) reported by the state. Critical thinking initiative types are organized on two levels. First, the initiative is either a state or local action. Second, the initiative is an already-existing program, a current initiative, or one pending implementation. The "Summary" column is a synthesis of all the data reported by the state for each initiative. Specifically it identifies the type of initiative reported, gives the name of the initiative if applicable, provides the number or percent of students served, and highlights strategies for implementation. The "Funding" column identifies the source of funding for the initiative. If reported, the amount of funding contributed to the initiative also appears in this column. The column marked "Impetus" provides information about the catalyst for the initiative. The "Implement" column provides program implementation strategies for the reported initiative.

Finally, the Council included the "Middle" column to identify those critical thinking initiatives by states that specifically target the middle grades. The middle grade years (usually including students aged 10 through 15 in grades six through nine) are a critical stage of development for youngsters, and pivotal in the determination of students' educational outcomes. Cognitive development during adolescence emphasizes a shift from concrete operations to formal operations where students consider ideas of greater complexity, reason with multiple variables, and appreciate a more sophisticated level of subtlety in mathematics, literature and politics. The Council believes it is crucial for schools to recognize, strengthen, and enhance this capacity for intellectual development in order to improve the odds of long-term school achievement and educational success.

The data table for students with special needs contains columns headed by: State/Type; Summary; Classification; Impetus; Goals; and implement. This table differs from the general student population table only in that it adds a column marked "Classification" and drops the "Middle" column. The "Classification" column identifies the targeted student population for the initiative.

B. CCSSO Questionnaire: State Critical Thinking Initiatives

Questionnaire Design

How has recent research in cognitive development impacted state education reform of curriculum, instruction, student assessment, staff development, and teacher education programs in the states?

The **CCSSO Questionnaire: State Critical Thinking Initiatives** requested comprehensive documentation of state actions to promote the teaching of critical thinking. The survey was designed to highlight the progress of state efforts to promote the teaching of critical thinking, assess the future needs of the states in this area, and serve as a resource to state and local education agencies for replication of promising state practices. The Council wanted to highlight state education agency policies that encourage local school districts to teach critical thinking and reduce barriers that inhibit such teaching.

The survey instrument was divided into two sections. The first set of questions focused on efforts to teach critical thinking to the general student population. The second set concentrated on state efforts to provide higher order instruction to special needs students. While the survey was divided by differences in student populations, both sections of the survey solicited the same type of information. Specifically, the survey requested information about:

- the type(s) of state initiatives used to promote the teaching of critical thinking;
- grade levels, academic disciplines and characteristics of students targeted by the critical thinking initiative(s);
- the components of technical assistance provided to local school districts from the state to encourage the teaching of critical thinking;
- the source and amount of funding allocated for state critical thinking initiatives; and
- the impetus, goals, and process of implementing state critical thinking initiatives.

States were asked to complete the survey and provide documentation or supplementary materials when appropriate. The survey was mailed in the spring of 1990 to every chief state school officer and his/her designee. CCSSO recommended that respondents consult with colleagues in the curriculum, instruction, compensatory education, assessment and staff development departments when completing the survey.

Conceptualization of the survey instrument began with clarification of terms. For instance, a fundamental first question has to do with the state's definition of critical thinking. What types of SEA activities would constitute a state critical thinking initiative? Are there particular elements or components inherent in critical thinking initiatives that differentiate them from other types of state initiatives? CCSSO determined state critical thinking initiatives to be those activities which develop, strengthen and implement strategies to improve higher order learning.

C. Survey Response and Findings

While we do not have special projects to teach critical thinking, we do feel that it has to be infused systematically, i.e., through curriculum, assessment, and staff development.

> **—Jim Smith**
> Deputy Superintendent
> California Department of Education

State education agency response to the CCSSO survey was very good. CCSSO received 50 completed questionnaires from the states, the District of Columbia and Puerto Rico. Of the states responding, 42 had previous, current or pending state and/or local critical thinking initiatives. The majority of those states incorporated critical thinking into traditional subject disciplines through improved instructional methodologies. There were a few states whose critical thinking initiatives included demonstration programs which involved separate curriculum materials and time periods for instruction. Nine respondents indicated that they do not have initiatives underway that focus on critical thinking.

For the most part, states have concentrated their critical thinking initiatives in four areas. These include: **curriculum revision, staff development, student assessment,** and **policy reform**. There was some variation, however. Thirteen states plus Puerto Rico reported critical thinking initiatives targeting students with special education needs. Eleven states had a particular middle grades focus for their critical thinking initiative. Three states promoted the teaching of critical thinking through research studies, incentive grants and/or demonstration projects.

1. Curriculum Revision

The state data indicate curricula have been revised to reflect elements of critical thinking through:

- *Curriculum frameworks* developed by the state education agency to influence textbook adoption and selection of other instructional materials, and to assist local districts in curriculum planning. These frameworks often suggest a sequence for learning and delineate appropriate concepts, skills and activities for each subject discipline.

- *Curriculum/instructional activities* including: state support of local pilot and demonstration programs; local integration of critical thinking elements into regular classroom instruction; local development of critical thinking programs separate from and supplemental to regular instruction; legislated or otherwise required state education agency goals providing for the teaching of critical thinking skills; and curriculum models emphasizing classroom instructional strategies and/or organizational patterns.

- *Curriculum/assessment* linkages where curriculum is closely aligned with state testing programs.

One example of a state initiative to improve student thinking and reasoning that centers on curriculum is **California's** work with its curriculum frameworks. California's curriculum initiatives resulted from the 1983 passage of SB 813.

The California initiatives include Model Curriculum Standards for grades K-8 and 9-12, and Curriculum Frameworks for grades K-12. The Model Curriculum Standards include critical thinking or problem-solving in each of the disciplines. The Model Curriculum Standards are intended to encourage use of curriculum materials and textbook selection which promote the development of students' capacities for thought and mental activities typical of successful achievement in the world of adult work. The stated goal is to prepare students for employment and citizenship, and promote students' intellectual, ethical, cultural, emotional, and physical growth.

Curriculum Frameworks have been developed by the California Department of Education for grades K-12 in the academic disciplines of mathematics, history/social studies, and English/language arts. The Frameworks stress an integration of thoughtful inquiry into the complete academic curriculum for all students. They emphasize the importance of processes of thought and connections between ideas intrinsic to each academic content area.

2. Staff Development Activities

Returns from the Council's survey show that state efforts to incorporate critical thinking into staff development programs occurred primarily through:

- *State-wide conferences;*

- *Technical assistance* to local districts by the state education agency for staff development through series of workshops and follow-up activities providing guidance on improving teaching that supports higher order learning;

- *Pre-service education* changed by upgrading teacher certification criteria and licensure requirements to include training in the teaching of critical thinking;
- Modifying *pre-service education* so that education coursework became a component of a subject discipline for undergraduate work; and
- *Promotion/technical assistance* whereby the state established a cooperative network of administrators and educators to examine a variety of issues, including critical thinking.

Hawaii's in-service training initiative "Basic Academic Skills Improving through Core Subjects" (BASICS) is an example of one state's effort to improve professional development. The focus of the BASICS program is to infuse critical thinking and language strategies into content area instruction. This initiative targets teachers in grades K-12 in seven districts. The academic disciplines included in BASICS are language arts, mathematics, social studies, science, art education, physical education, and Asian, European, and Pacific languages. According to the Hawaii Department of Education, this program has been incorporated into the regular subject instruction and was developed to teach students how to analyze and solve problems, to reason and think given incomplete information, and to think about thinking (metacognition).

The Hawaii Department of Education's Office of Instructional Services staff conducts in-service training throughout the school year and summer throughout the state. District staff, as well as state staff, provide follow-up technical assistance as requested to the schools involved in the project. During the school year, substitute teachers are provided as needed.

3. Student Assessment

Findings from the CCSSO survey indicate that state testing programs were improved through initiatives that:

- Established *performance-based assessment measures* calling upon new instructional methodologies to create instructional / assessment alignment;
- Promoted improved *curriculum/assessment alignment* through subject matter content; and
- Established *pilot* or *demonstration programs* to develop more authentic testing measures.

Connecticut is one of the nation's leaders in developing a student assessment system that supports higher order learning. The state's Common Core of Learning Assessment in Mathematics and Science program examines student's knowledge and skills, and thinking abilities within the contexts of science and mathematics. Each performance task combines a knowledge of content, process, communication and collaboration. This mathematics and science assessment activity was begun in Connecticut as a result of the national movement to improve mathematics and science education. This initiative was developed in 1989-1991 and will be implemented in 1991-1992.

The Connecticut Common Core of Learning Assessment in Mathematics and Science is based on the belief that learning is facilitated when: the learning experience is active rather than passive; the performance called for is more holistic than atomistic; and the thought processes required are divergent as well as convergent. The expectations in Connecticut are that the assessment project will provide a model of the kinds of authentic and integrated tasks that teachers can use to blend learning and assessment activities.

In the school year of 1991-1992, the Connecticut Department of Education will conduct the mathematics and science assessments in a sample of school districts. The tests have been designed to include authentic performance tasks which require higher order thinking. The State Department of Education will provide technical assistance to school districts to train teachers and administrators to assess and score the assessment tasks.

4. Policy Reform

State critical thinking initiatives establishing or affecting educational policy included:

- *Certification/licensure measures* designed to drive pre-service training in teaching higher order thinking;
- Legislation to reform education emphasizing the importance of critical thinking skills; and
- Promotion of instructional methodologies that stress thinking and reasoning through dissemination of state education agency research.

One example of state policy reform undertaken to improve instruction and emphasize thinking and reasoning is the **Texas** long range plan of 1985-90. The Texas plan is being implemented through the state's Realistic Educational Achievement Can Happen (REACH) program. The

State Board of Education's long range plan called for the coordination of statewide testing, textbooks, and instructional materials with the state mandated curriculum. The REACH program targeted several needs including critical thinking. According to the Texas Education Agency, the objective of the initiative is to "incorporate critical thinking and problem-solving skills throughout the curriculum."

D. Conclusion

The Council of Chief State School Officers survey on state critical thinking initiatives has identified a rich and diverse array of activities whose goal is to improve student thinking and reasoning.

Several of the initiatives described in the Appendix II charts have resulted in substantial improvements in curriculum, staff development, student assessment, or policy reform that are driving better instruction and resulting in qualitative increases in student learning. There are several states that have made impressive and thoughtful changes and that can serve as models for restructuring learning.

Significant work remains, however, if schools are to serve successfully *all* students and ensure that every student receives an education of higher order learning. Most of the initiatives reported by states centered on curriculum change and involved the development of impressive new curriculum guides and materials. However, state efforts to implement these curricular changes—professional development activities, additional funding, release time for teachers—varied widely. Some of the programs identified in the charts operate as pilot efforts and so serve only a limited number of students. Others do not enjoy full funding and also face limitations on serving all students.

Several initiatives are limited only to changing one of the four elements noted above—curriculum, professional development, student assessment or policy reform—and are weakened by the absence of an integrated and comprehensive plan for change that recognizes the interaction among these four areas. For example, several of the states involved in curricular changes did not link these efforts to necessary parallel changes in student assessment. A few of the programs state as their goal supporting improved student thinking, but are not sufficiently clear about how teaching and learning for all students, particularly those placed at greatest risk, will actually change. This is especially apparent in some efforts that emphasize shifts from schooling focused on providing basic skills to schooling emphasizing higher order learning.

Some of the programs listed in the charts in Appendix II do not identify the special efforts necessary to ensure an education of higher order learning for those who traditionally have not had access to that sort of instruction. For example, few states focused specifically on the important and complex concerns of improving higher order learning for language minority students.

The Council calls on all educators and policymakers to consider the successes and difficulties identified in these charts and press ahead with greater commitment to ensuring that *all* students in America receive an education that prepares them to lead productive and responsible lives as adults in this decade and the century that follows.

APPENDIX I

RESTRUCTURING LEARNING FOR ALL STUDENTS

A Policy Statement by the
Council of Chief State School Officers
on Improved Teaching of Thinking

Introduction

At the closing of the 20th century, dynamic and unanticipated global changes of a profound sort are occurring. National borders, ideologies of nations, the locus of economic power, and political alliances are shifting with remarkable speed. The demand for democratic governance advances in different parts of the world. The 21st century will begin with a very different world map, alignment of forces, and rules than have been known for most of this century.

To prepare our nation for these changes requires a commitment to learning for all that is greater than ever before made.

Our political economic and social structures depend on that commitment.

American education must lead the continuing renewal of our institutions. In a fundamental sense, American education also must be renewed. The confluence of a unique set of forces in the 1990's provides both a substantial challenge and an extraordinary opportunity for dramatic improvement and change in what, how, and how well American students learn.

One powerful stream at that confluence is the fundamental shifts which are taking place in the economy. According to the Commission on the Skills of the American Workforce in its report, **America's Choice: High Skills or Low Wages!**, deep and revolutionary change is necessary regarding the structure and organization of production, if this country is going to maintain its current standard of living in the world economy. The organization of production in the United States needs to undergo radical changes which will result in demands for highly skilled workers at levels never before required. The labor force needs of this decade and the next century will dictate that *all* workers—not just a small elite cohort—but workers at all levels must have well-developed abilities to learn easily and adapt to new circumstances on the job; to read complex materials, understand, and apply them; to use quantitative skills appropriately; to apply tools of production and management; to speak and write effectively; to work cooperatively as members of a team; and to undergo retraining, perhaps repeatedly.

The rapidity and fundamental nature of such change also present increasingly difficult demands on responsible citizenship. New relationships in politics and economics create new problems as well as novel benefits, and so require the ability to perform critical reviews, make ethical judgements, and take principled action by all citizens. These changes raise the level of complexity of choices and decisions—whether issues of distribution of resources, of peace and war, of social justice, of the environment—in a world seemingly shrunken by advancements in technology. It is imperative for a democratic society where decisionmaking is intended for all, that we provide the basis for higher order learning for all in order to enable our populace to make necessary civic decisions.

Schools, previously asked to ensure the development of basic skills, are now required to teach all students a new, broad range of cognitive skills demanded by the changing contexts in which students live. This new demand on schools is nothing less than a call for the democratization of thinking. Such a call brings sharp attention to those students placed most at risk to school success. Successful restructuring of learning that supports higher order learning for *all* students will require intense and persistent work, with particular emphasis given to the resources necessary to ensure that students placed at risk succeed as well.

Definition of Higher Order Learning

Another stream at this confluence includes the new findings from the cognitive sciences regarding the nature of thinking and the acquisition of thinking and learning capacities. Researchers do not agree on a precise and complete definition of higher order learning, but they do agree on key characteristics of higher order thinking. It is complex; yields multiple solutions; requires interpretation and the use of multiple criteria; involves uncertainty and finding structure in apparent disorder; demands self-regulation of thinking processes; and requires considerable mental effort. Insights from a substantial body of research provide techniques for improving teaching in ways that support higher order learning in the disciplines and the development of problem-solving skills. These are extraordinarily important to succeed with the agenda of the 1990's—extending the learning of high level thinking and reasoning abilities to *all* students.

The elements of higher order learning are not new. They represent timeless, longstanding concepts of learning never realized universally but only by small fractions of the population. What differs at the close of this century is that education for higher order learning is essential for *all*.

Principles to Support Restructured Learning

Based on a review of research in the cognitive sciences regarding thinking and learning, the Council extends the following principles to guide state policymakers and other education decisionmakers as they attempt to restructure learning for all:

- **Ensure that all students receive an educational program that supports higher order learning**. It is imperative that all students, especially those placed at risk, have the opportunity and the necessary instructional and social support to develop fully their thinking and reasoning abilities for success in school and as adults. Particular effort must be made by state education agencies and all others in education to ensure the provision of such an education for disadvantaged students whose schooling frequently lacks a commitment to teaching for higher order learning. The teaching of thinking and reasoning must be integrated throughout all educational programs—whether in "regular" classrooms or in special programs for students with extra educational needs.

- **Acknowledge different rates of development and learning**. Students learn at very different rates. For those students who do not meet high standards and achievement outcomes by expected times, schools must provide intense supplementary resources.

- **Make certain that the teaching of thinking and other higher order skills are part of direct preparation for work**. Higher order learning should be immediately useful not only for those students who will attend post-secondary schooling but for those students who enter the workforce directly from secondary school.

- **Emphasize the teaching of thinking skills across all grade levels**. Research on thinking demonstrates clearly that higher order skills are required for learning at all levels of academic study. Teaching should emphasize thinking and problem-solving for all students. The development of "basic skills" should be simultaneous with the teaching of thinking and should not be considered a prerequisite to higher order learning.

- **Incorporate teaching of thinking skills in all parts of the curriculum**. Research indicates that thinking skills are best taught when based within subject disciplines. Several programs that teach thinking skills apart from subject matter can be effective as supplemental activities and deserve consideration, but there is general agreement that thinking skills should, at a minimum, always be taught within the subject areas. Courses in thinking skills should not substitute for the infusion of thinking and reasoning within the curriculum.

- **Ensure that classrooms serve as environments that support higher order learning**. While no simple formula or ratio exists to guarantee the creation of such an environment, classroom structure—group size, organization of time, teacher responsibilities, etc.-must foster interaction that encourages learning. Students must be able to work cooperatively, have access to effective learning technologies, and be able to participate in sustained conversation about a specific subject.

- **Acknowledge and support a diversity of instructional approaches to support thinking**. Recent research in psychology and cognition identifies a variety of learning styles and intelligences. Instruction for higher order learning must adapt methods to differing styles, but keep constant the outcome of high achievement. Efforts toward flexibility in instructional method should also take into account differences in cultural styles and gender regarding student and teacher interaction. All such efforts must include high order intellectual challenge. Methods should differ but expectations for outcomes should be the same.

- **Assure student assessment measures higher order learning.** The content and design of assessment should provoke and engage students' knowledge and judgment, and require careful thought and problem-solving. Take seriously the adages "you get what you assess" and "teaching to the test", and build assessment measures that demand the sort of teaching that supports higher order learning. Teaching to the test can be a desirable strategy when the test assesses knowledge and skills indicative of high levels of thinking and reasoning. Examine current efforts by several states which have adopted operational science assessments, extended essays in language tests, portfolio assessments, and other performance examinations.

- **Provide significant and appropriate professional development opportunities**. Success at teaching for higher order learning requires fundamental changes in content, method, organization and relations within the classroom and supportive changes throughout the school system. These changes should lead to the creation of a supportive environment for thinking and learning within the classroom where the teacher acts as the facilitator for learning. These new roles are fundamentally different from those presented in typical teacher preparation and so require substantial re-education for experienced and new teachers and administrators. Furthermore, university-based teacher education programs must change significantly how they prepare their students. All these efforts will require time and financial resources.

- **Communicate expectations of student higher order learning to families and the community**. Educators must enlist the support of families and community organizations in achieving higher order learning goals for students. Expanded opportunities must be created for collaborative involvement between home and school in achieving this goal. Families must know of and be assisted in fulfilling their role in maximizing student learning and monitoring the progress of schools in meeting their responsibility to students.

Implementation Strategies

The advances made in the cognitive sciences during the last two decades must inform restructuring of education practice. The bridge between what the theorists, the researchers and the scholars have discovered and actual practice must be built anew.

State education agencies can and must take a leading role in advancing the adoption and use of these powerful developments in the cognitive sciences. Implementation demands fundamental changes in the nature and organization of schooling. The states must assist local education agencies with technical, administrative, and financial assistance to ensure both the development of excellent instructional practice and equitable provision of such practices. States must establish new strategies for curriculum development, research and development, student assessment, professional development, and financial support.

Examples of strategies that will strengthen instruction and support higher order learning for all include:

- **Provide necessary additional funding, materials, time, technical assistance, or sanctions to ensure that schools offer *all* students an education of higher order learning**. Because schooling for low income, minority, and language minority students typically is not one of higher order learning, extra effort must be made by states to make certain that schools restructure teaching and learning so that these students receive an education of thinking and reasoning.

- **Design curriculum frameworks and corresponding instructional materials, and direct the selection of textbooks that integrate knowledge; that support higher order learning; and that are sufficiently flexible to students' developmental needs and differences**. Such curricula should deepen the content of disciplines and affirm the contributions and perspectives of diverse cultural and linguistic groups, while increasing sensitivity to gender differences.

- **Design student assessments to measure accumulated, complex accomplishments rather than testing samples of discrete skills**. Acknowledge that the design of student tests drive the content and method of instruction, and frequently are an impediment to curriculum reform. Multiple choice tests are not consistent with teaching critical thinking, focus on lower-level skills, and frequently have a deleterious effect on the education of students.

- **Ensure that professional development activities provide teachers and administrators—as well as staff of local and state education agencies—with the capacity to promote higher order learning for all students in school and at home**. Most teacher education programs do not provide sufficient preparation or experience to ensure such learning, especially for culturally and linguistically diverse students. Nor do they prepare teachers to work appropriately with families in this effort. States should provide professional development that is of sufficient quality (i.e., provides models of successful instruction for all students), length (i.e., lasts over periods of weeks and months and so provides continuity of support), and breadth (i.e., is available to teachers, administrators and staff of local and state education agencies) to ensure effective preparation, the development of local capacity, and systemwide change. States should also influence teacher pre-service education to include similar preparation.

- **Ensure parental and community support of instruction for higher order learning by engaging their active participation in all facets of schooling including the development of plans for achieving higher order learning goals, and in the implementation and evaluation of the activities that follow**. Special efforts and resources should be directed to elicit the support of those parents and communities that traditionally have not been active supporters of public education, and should be directed toward ensuring continuity of higher order learning processes beyond the classroom.

Conclusion

All educators, including chief state school officers, must be committed to the provision of a high quality education for *all* students that results in critical and creative thinking, cooperative problem-solving, reasoned and ethical analysis, responsible and moral action, and a life-long disposition for thinking and learning. Educators must pledge their efforts to assist all children and youth but reserve particular and intense commitment for those students who historically have not been provided an education of higher order and thoughtful learning.

CCSSO Initiatives

In 1989 the Council of Chief State School Officers examined efforts by states, local education agencies, and national organizations to change the practice and organization of schooling—to restructure schools. In that effort the Council reviewed activities related to changes in school governance, the nature and organization of the curriculum, professional roles for educators, and accountability that supports school restructuring. The Council also noted principles and strategies for restructuring schools. The fundamental criteria for success in school restructuring were, does the restructuring result in improved student learning, and does it allow students to reach their full potential?

The Council's work during 1990 builds on the previous year's emphasis on restructuring schools, and focuses its efforts on restructuring learning—fundamentally changing the relationship among student, teacher, knowledge, and other students in ways that support the development of higher order learning for all students. The Council has examined a broad range of work related to improving student thinking: recent advances in cognitive research about the nature of thinking; new efforts within the disciplines of language acquisition, mathematics, science and social studies; successful programs that teach thinking skills; changing the teacher's role to better assist the development of student thinking; and altering assessment in ways that helps support the teaching of higher order learning. The Council has also identified a set of principles to inform and guide state and local efforts to foster improved student thinking.

APPENDIX II

STATE-BY-STATE CHARTS ON CRITICAL THINKING INITIATIVES

STATE CRITICAL THINKING INITIATIVES: GENERAL

State/Type	Summary	Funding
Alabama		
State curriculum/instructional initiative, "The Alabama Facilitator Project."	"The Alabama Facilitator Project" offers four programs to local schools. All four programs encourage and support critical thinking skills. They include: Critical Analysis and Thinking Skills (CATS), targeting grades 9-12 (although it has also been used in lower grades); Talents Unlimited targets grades 1-6, Project Success Enrichment grades 2-8, and Impact (grade levels not reported). Professional development activities in the past have included the following workshops: Orientation to Space for Teachers, Science Workshop for Middle School Teachers, SeaLab and several in foreign language acquisition. The SEA supports this initiative through its 1984 *A Plan for Excellence: Alabama's Public Schools*. The plan recommends coursework that would challenge all students to think, create, and reason, and encourages the schools to assess the status of critical thinking instruction and provide additional instruction if necessary.	No information regarding the funding for this initiative was reported.
Alabama		
State curriculum initiative to revise the *Alabama Course of Study: Mathematics*.	The Alabama Course of Study: Mathematics emphasizes problem solving and stresses analytical reasoning. All students in grades K-12 mathematics classes are served in this initiative with fundamental changes in grades 7 and 8. Thinking skills are emphasized throughout the mathematics curriculum. Students are asked to solve open-ended problems, reason in a variety of formats, make logical predictions based on realistic data, and communicate mathematical ideas involved in solving equations. This initiative was influenced by the national movement to improve mathematics education, the publication of the *Curriculum and Evaluation Standards for School Mathematics* by the National Council of Teachers of Mathematics, and the perceived need for improvement in mathematics for many Alabamians.	The SEA contributes funding for periodic revisions. The amount of contribution was not reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus of this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
The impetus is a result of a national movement to improve mathematics education, by the publication of *Curriculum and Evaluation Standards For School Mathematics* by the National Council of Teachers of Mathematics, and the stated need for improvement in mathematics for many Alabamians.	The goal of the *Alabama Course of Study: Mathematics* is to provide a consistent quality of mathematics instruction across the state which will result in an equal opportunity for all students to become mathematically literate. It is expected that its implementation will assist teachers in teaching students to value mathematics and become confident in their abilities to reason, problem solve, and communicate mathematically.	The SEA distributes the *Alabama Course of Study: Mathematics* document to each teacher and provides staff training on its use. Training is provided during the summer prior to the first year of implementation using a trainer's guide. Since this document is mandated by the Alabama State Board of Education, all mathematics teachers in Alabama are expected to incorporate changes and recommendations into mathematics instruction.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Alabama		
State curriculum/instructional initiative, Project WILD.	Project WILD's main project elements include problem solving and decisionmaking skills in determining human action regarding the environment in general and wildlife in particular. Project WILD is both interdisciplinary and supplementary. It can be used to teach basic skills in science, social studies, language arts, mathematics, art, music, and physical education. All grades K-12, as well as special education students, can participate in Project WILD. Critical thinking is embedded within a wide variety of instructional strategies. Project Wild was begun in Alabama as a result of a need to develop long term approaches to environmental problems as well as to foster the development of critical thinking skills in children. The main goal of the project is to assist learners in developing awareness, knowledge, skills, and commitment that result in responsible human actions regarding wildlife and the environment. This initiative was first implemented in the summer of 1988. Outcomes measured by the state show a heightened awareness, appreciation, and understanding of wildlife and natural resources among students while they learn to make responsible decisions regarding them.	The Alabama Department of Conservation, Division of Game and Fish Conservation contributes approximately $50,000 per year to this initiative.
Alaska		
State instructional initiative, "Science, Technology and Society in Alaska."	"Science, Technology and Society in Alaska" (STS) promotes the teaching of critical thinking through science, social studies, and technology in academic disciplines. STS serves and targets all students, K-12. STS is incorporated into the regular subject instruction emphasizing how technology affects more and more aspects of our lives. Alaska asserts that it is essential that citizens in our democracy be able to participate intelligently in shaping the use of technology for appropriate societal needs.	No information regarding funding for this initiative was reported.

Impetus	Goals	Implement	Middle
Project WILD began in Alabama as the need to develop long term approaches to environmental problems and to foster the development of critical thinking skills in children.	The main goal of Project WILD is to assist students in developing awareness, knowledge, skills, and commitment resulting in responsible human actions regarding wildlife and the environment.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	Alaska asserts that as technology affects more aspects of our lives, it is essential that citizens be able to participate intelligently in shaping the use of technology for appropriate societal needs.	The Science Technology and Society (STS) Leadership Cadre embodies a support network of science and social studies teachers in Alaska. The network of teachers implements the STS approach in the classrooms, provides training of STS to other teachers, and advises the SEA on plans to implement STS statewide.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Alaska		
State curriculum initiative "Student Outcomes."	"Student Outcomes" incorporates critical thinking into regular classroom instruction. The SEA reports that the purpose of public education in the state is to ensure that each student possesses the knowledge, skills, and attitudes required for responsible citizenship, economic productivity and personal fulfillment. The SEA believes that such education is the responsibility of every student, parent, school and community. All students in grades K-12 are served by Student Outcomes in all academic disciplines. The Student Outcomes was initiated in 1990. It requires that each school district develop, with community involvement, the skills students must learn to attain specified outcomes.	No information regarding funding for this initiative was reported.
Alaska		
State in-service/technical assistance initiative, the "Alaska Staff Development Network."	The Alaska Staff Development Network promotes the teaching of critical thinking through a series of statewide staff development workshops. The Network pools resources to improve the quality and coordination of training for the Alaskan teachers and administrators. The Network was founded on the belief that the unique professional growth needs of Alaska's teachers and administrators can be best met by strengthening collaborative relationships among 50 school districts, NEA-Alaska, the Alaska Council of School Administrators, Alaska's colleges and universities, the Northwest Regional Educational Laboratory, and the Alaska SEA.	The SEA contribution to the initiative was not reported. Ninety-five percent of the Alaska Staff Development Network is funded by consortium members and other external funding totalling $713,000.
Arizona		
No state or local critical thinking initiative(s) reported.		

Impetus	Goals	Implement	Middle
Student Outcomes was a response to the following: 30% of Alaska's ninth graders were not graduating from high school; scored poorly on tests of achievement; Alaskan businesses were having trouble finding competent young workers to hold jobs in a changing technological work place; and society had changed, but the schools had not.	The SEA asserts that all students can learn and therefore expects each student in Alaska will: communicate effectively, think logically and critically, discover and nurture his or her own creative talents, master essential technological skills, demonstrate responsible citizenship, develop a commitment to health and fitness, develop personal responsibility to sustain one's self economically and acquire a positive self-image.	Student Outcomes will set state standards for students' performance. Each school district will develop, through a community involvement process, the skills students must know to attain these outcomes. A local and state accountability system will evaluate and report the results.	This initiative does not specifically target the middle grades.
The Network was initiated in April 1983 in order to implement recommendations developed by then Governor Jay Hammond's School Effectiveness Task Force. Recommendations were not reported.	The goal of the Alaska Staff Development Network is to improve the quality and coordination of training for Alaskan teachers and administrators.	The Alaska Staff Development Network is governed by a steering committee. The committee establishes network policy and direction. A meeting of all 60 network sponsoring agencies is held each April to share information and set network priorities. Network training programs are developed and modified by program planning teams composed of representatives from network member agencies. Planning teams meet regularly in person or by tele-conference.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Arkansas		
State curriculum initiative, "Multi-cultural Reading and Thinking" (McRAT).	"Multi-cultural Reading and Thinking" (McRAT) initiative involves reading, thinking, and writing with a multi-cultural focus. McRAT develops students' critical thinking abilities and multi-cultural concepts through direct instruction. Students are asked to read multi-cultural literature, both narrative and expository, to think critically about what they have read, and to communicate what they have learned in writing. Instructional goals focus on four categories of reasoning skills that students can use in academic subjects such as reading, literature and social studies, and that also transfer to practical situations. These four categories include: analysis, comparison, inference/interpretation, and evaluation. These are fundamental frameworks of inquiry, problem solving, and critical thinking. Students learn explicit strategies for each category as well as metacognitive strategies which help them plan, monitor, and evaluate their critical thinking processes. Teachers and students apply criteria derived from the thinking strategies to determine the success of critical thinking assignments. McRAT targets grade levels 4, 5, and 6. It serves 2,200 students in 15 school districts. The program began in the fall of 1986. McRAT teaches thinking skill strategies across the curriculum.	Since 1988, the McRAT Program has been funded through legislative appropriation for reading programs and administered by the Arkansas Department of Education. The SEA contributed $100,000 for school year 1989-90 to this initiative.

Impetus	Goals	Implement	Middle
The McRAT Program was developed in Arkansas as a result of the national movement to improve the teaching of thinking in schools; state efforts to restructure for higher order learning; and surveys of local school districts indicating critical thinking as a top priority for staff development.	The goal of McRAT is to develop student's critical thinking abilities and cultural awareness through direct instruction. It is based on the belief that 1) all students can benefit from explicit instruction in thinking strategies which transfer across the curriculum and to real life situations; (2) application of critical thinking and problem solving strategies to real life concepts is an effective way to develop understanding and appreciation of cultural differences; and (3) program goals can be met by refocusing typical curricula and using existing classroom materials and resources. Instructional goals of the McRAT program focus on student attainment of skills in analysis, comparison, inference/interpretation, and evaluation.	The SEA together with local districts requesting the McRAT program collaborate in a two-year process of implementation. The SEA provides intensive training and technical assistance. Local districts provide administrative support, arrange release time for teachers, develop leadership within the district to assure continuation of the program, support change and flexibility in curriculum, and collaborate in data collection and evaluation.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
California		
Curriculum, instruction, and assessment initiatives.	The California Assessment Program tests all public school students annually in grades 3, 6, 8, and 12. The content areas currently assessed at grades 3, 6, and 12 are English-language arts and mathematics. In addition to these content areas, the grade 6 test assesses history-social science and science, focusing on higher-order thinking skills. The tests at grades 8 and 12 also include an assessment of actual student writing. Breaking away from exclusive reliance on multiple-choice tests, CAP has begun introducing more authentic, performance-based assessments that indicate more directly what students actually know, how well they can think, and what they can do.	The California Assessment Program is funded through the General Fund of the State of California.
California		
State curriculum initiative.	This initiative has two components including: Model Curriculum Standards for grades 9-12, and Model Curriculum Guides for grades K-8. These documents target the academic disciplines of math, literature, language arts (particularly writing), history/social science, science, foreign language, and visual/performing arts. The critical thinking/problem solving strategies were incorporated into regular instruction of each of the above academic disciplines. The MCS&G support the development of student capacities for thought in line with the state's effort to establish clearly defined standards of student performance that incorporate intellectual activities typical of successful achievement in the real world. The MCS&G are concerned with the preparation of students for employment and citizenship, and their intellectual, ethical, cultural, emotional, and physical growth.	The Model Curriculum documents were funded by general SEA funds. The amount of contribution was not reported. Federal dollars from the Chapter II program also contributed to the Model Curriculum Guides. No amount or percentage of federal allocation was reported.

Impetus	Goals	Implement	Middle
As one part of the reform effort required by California's Educational Reform Act of 1983, local instructional programs are to be evaluated based on student-achievement on CAP tests aligned with California's new curriculum frameworks. These frameworks emphasize the importance of higher-order thinking for all students at all grade levels.	CAP is developing an assessment system that will measure student achievement on the performance-based measures essential for driving educational reform efforts towards a thinking curriculum.	All of the CAP tests are under revision or in the developmental stage at this time. New assessments are being implemented which support a thinking curriculum: Director writing assessments have been in place at grades 8 and 12 for several years, and field testing of integrated reading and writing assessments at the elementary and high school levels will take place in the spring of 1991. Open-ended items, for which students must construct their own solutions, have been included in the CAP tests in mathematics and field tested in science and history-social science. Performance assessments have been pilot tested in science and history-social science. Pilot portfolio projects are continuing in English-language arts and mathematics.	This initiative does not specifically target the middle grades.
The Model Curriculum Guides were developed as part of the education reform movement in California dating from 1983 with passage of SB813 and support by the Superintendent of Public Instruction.	No information regarding the goal of this initiative was reported.	The Model Curriculum documents were developed for each academic discipline. Districts are required to compare their high school curriculum against the state adopted standards. Districts are encouraged to use the K-8 guides in curriculum examination and improvement efforts. The state curriculum documents have been referenced in state program advisories as well as requests for proposals.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
California		
State instructional initiative for the middle grades from recommendations in the Middle Grades Task Force report, *Caught in the Middle*.	The initiative for the middle grades emanated from recommendations from the Middle Grades Task Force report, *Caught in the Middle*. The report includes a chapter entitled, "Learning to Learn" which stresses the importance of independent and cooperative learning situations to facilitate "mastery of new skills including higher order thinking and communicating skills." One of the recommendations is the formation of a statewide network of partnership schools working together to become state-of-the art middle schools. California has worked with 115 schools for the past two years and is now in the process of forming a second statewide network of 111 schools. The state is working to change the way instruction is delivered to middle grade students based on knowledge of their developmental characteristics.	No information regarding the funding for this initiative was reported.
California		
State legislative initiative, SB813, Education Reform Legislation passed in July, 1983.	SB813 passed in July, 1983 and calls for education reform in California. SB813 legislates reconstructed curriculum, instruction, and assessment programs that promote students' capacities for productive thought.	No information regarding funding to this initiative was reported.
California		
State technical assistance initiative Curriculum Projects involve subject-specific research and methodology for improved teaching.	This initiative involves subject-specific research and methodology for improved teaching. These subject area projects are developed on state university campuses, and are based on the California Writing Project model. They include: the California Math Project and the California Literature Project. The model provides intensive staff development about the latest research and methodology for teaching a particular subject. All students, grades K-12 are served by this initiative. Critical thinking/problem-solving strategies are incorporated into the training of each of the teachers who are then trained to serve as trainers in their districts or schools.	The SEA contributes funds to this initiative. The amount of contribution was not reported.
California		
State curriculum initiative, Curriculum Frameworks.	Curriculum Frameworks serve all students in grades K-12. Each Framework includes critical thinking or problem solving. The Frameworks cover the following academic disciplines: math, literature, and history/social studies. The Frameworks stress integration of thoughtful inquiry into the complete academic curriculum for all students. Emphasis is placed on the essential importance of the processes of thought and connections between ideas intrinsic to each academic content area.	The SEA contributes funds to this initiative. The amount of contribution was not reported.

Impetus	Goals	Implement	Middle
The impetus for this initiative was the set of recommendations in *Caught in the Middle*.	The goal of the middle grades task force is to change the way instruction is delivered to middle grade students based on knowledge of their developmental characteristics.	The Task Force report, *Caught In The Middle* was published in 1987. The first network was formed in June, 1987 and the second in June of 1990. Each network is scheduled to operate for a 3-5 year period.	The recommendations setforth in the document *Caught in the Middle* specifically targets middle grade students.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	The goal of the California Subject Matter Projects (CSMP) is to strengthen teachers' subject matter knowledge and improve instructional practices.	Implementation begins through intensive staff development about the latest research and methodologies for teaching a particular subject. Teachers are trained to teach critical thinking and problem solving skills, and are prepared to serve as trainers in their districts or schools.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Colorado Local curriculum/instructional initiatives, both integrated with and separate from the regular curriculum.	Although there is no state critical thinking initiative, Colorado reported many local initiatives that encourage the teaching and learning of critical thinking including: Tactics for Thinking, Thinking Skills: A Conceptual Framework; Dimensions of Thinking: A Framework for Curriculum and Instruction; Colorado Writing Project; Family Math; Equals; Math Solution; Rocky Mountain Math Education Consortium Summer Projects; Great Exploration in Math and Science; Chemistry in the Community; Voyage of Mimi; Enlist Micros; Family Science; Principles of Technology 9-12 Industrial Arts and Physics; Biological Science Curriculum Study K-6; Chemistry Understanding for Public Understanding Program; Decisions for Today and Tomorrow–Issues in Science Technology and Math; and Global Science. No percent of students served was reported.	The SEA contributes funding through the Commission on the Bicentennial of the U.S. Constitution for some of these initiatives. The amount of contribution was not reported.
Connecticut State in-service/technical assistance initiative, Institute for Teaching and Learning.	The Institute for Teaching and Learning offers a variety of professional development experiences for teachers of grades K-12. Three major formats are used: (1) in-depth conferences on particular topics, (2) two week workshops and seminars on particular topics, and (3) Program Improvement Institutes. The Program Improvement Institutes are designed to help school districts improve their programs in selected areas. Grades K-12 and all academic disciplines are targeted. No special needs groups were targeted.	In 1990-1991 the SEA will contribute $1.6 million to this initiative. Approximately one-twentieth of the total funding has gone to thinking skills.

Impetus	Goals	Implement	Middle
No information regarding the impetus for these initiatives was reported.	The goals may include one or more of the following: improve student abilities; provide training for teachers in improving student learning through development of thinking skills as expressed in writing, communication, problem-solving, decision making, analysis, and evaluation; develop active, hands-on approaches to teaching math.	Implementation strategies include the following: leadership in setting up project sites and curriculum; provision of facilities and scholarships.	This initiative does not specifically target the middle grades.
In 1983 Connecticut embarked on a major initiative, the Institute for Teaching and Learning, to help improve teacher practice. The institutes were on a number of activities designed to offer high quality professional development experiences to Connecticut's veteran teaching force. The Institute first focused on improving the teaching of thinking skills in 1985.	To offer high quality professional development experience to Connecticut's veteran teaching force.	Individual teachers who attend conferences and seminar workshops introduce what they have learned to their classrooms. Program Improvement Institutes provide a team of administrators and teachers, who offer on-site assistance in implementation of the program, and help to form the support to institutionalize the program in the schools.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Connecticut		
The State assessment initiative, Connecticut Assessment of Educational Progress (CAEP).	Connecticut Assessment of Educational Progress (CAEP) emphasizes critical and creative thinking skills in eleven mandated curriculum areas. These areas included Art, music, business and office education, English, language arts, science, foreign language, industrial arts and technology education, drafting, graphic arts and small engines. Crade levels 4, 8, and 9-12 are targeted. The goals of the CAEP assessments are to: provide achievement results; compare the achievement of Connecticut students with students nationally when possible; and encourage local school districts to utilize CAEP instruments. The initiative was implemented in 1972 and became Common Core of Learning Assessment in 1989 and is integrated into all classrooms. No special needs groups are targeted.	The SEA contributes $100,000 per year to this initiative.
Connecticut		
State assessment initiative	Connecticut Common Core of Learning Assessment involves Mathematics and Science for all students participating, in grades 9-12. The state's science and mathematics program examines student's knowledge and skills and thinking abilities within the contexts of science and mathematics. Each performance task combines knowledge of content, process, communication and collaboration. The mathematics and science assessment activity was begun in the state of Connecticut as a result of the national movement to improve mathematics and science education. This initiative was developed during 1989-1991 and will be implemented in 1991-1992.	The SEA contributes funding to this initiative in part which totals $500,000.

Impetus	Goals	Implement	Middle
The impetus for this initiative was the Common Core of Learning Assessment (1989).	The goals of the Connecticut Assessment of Educational Progress are to: provide achievement results useful for decision making regarding curricula and instruction at both the state and local levels; collect baseline and longitudinal data for determining student growth in knowledge and skills in subsequent years; compare the achievement of Connecticut students with students nationally when possible; and encourage local school districts to utilize CAEP instruments and procedures for local evaluation and planning.	The SEA administers the assessments statewide and trains teachers to administer and, where appropriate, to score students' work. The test have been designed to include authentic performance tasks which include opportunities for higher order thinking skills.	This initiative does not specifically target the middle grades.
The mathematics and science assessment activity began in Connecticut as a result of the national movement to improve mathematics and science education. Previous test results and decreases in the numbers of students pursuing mathematics and science education at the college level prompted a decision to adopt an assessment tool that scientists and mathematicians perform in their own work. Development and pilot of this initiative was completed from 1989-91; implementation is in 1991-1992.	The Common Core of Learning Assessment in Mathematics and Science is based on the belief that learning is facilitated when: the learning experience is active rather than passive; the performance called for is more holistic than atomistic; and the thought processes required are divergent as well as convergent. It is expected that the assessment project will provide a model of the kinds of authentic and integrated tasks that teachers can use to blend learning and assessment activities.	The SEA will conduct the mathematic and science assessments in a sample of school districts in 1991-92. Training will occur during the summer prior to the administration of the assessment. The SEA will provide technical assistance to school districts to train teachers and administrators to assess and score the assessment tasks.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Connecticut		
State assessment initiative, Connecticut Mastery Test.	Connecticut Mastery Test (CMT) initiative targets students in grades 4, 6, and 8. The CMT includes a writing sample, problem solving skills in mathematics, and inferential and evaluative comprehension skills in reading. The academic disciplines targeted are language arts/reading and mathematics. This initiative was a part of a June, 1984 amendment to the Connecticut General Statutes. This initiative was implemented during the 1985-1986 school year. State Board of Education policy and 1990 legislation has authorized the development of a grade 10 mastery test commencing in the fall of 1993.	The SEA contributes $1.5 million to this initiative.
Connecticut		
State pre-service training initiative, Connecticut Teaching Competencies—Cooperating Teacher and Beginning Educator Support & Training Program.	Connecticut Teaching Competencies—Cooperating Competencies—Cooperating Teacher and Beginning Educator Support & Training Program involves fifteen teaching competencies, identified and used on the basis of pre-service training and in-service training and assessment of first year teachers. All academic disciplines were targeted in the initiative. Grades targeted are K-12, but students served are all students in grades 9-12.	The SEA contributes $10.2 million to this initiative.

Impetus	Goals	Implement	Middle
This initiative was part of a June, 1984 amendment to the Connecticut General Statutes to develop a plan addressing the following: use of student assessment results for instructional improvement; identification of individual students in need of remedial assistance in language arts/reading and mathematics; provision of general remedial assistance to those with identified needs; and evaluation of the effectiveness of the instructional programs in language arts/reading and mathematics.	The goal is to provide educational information which can be used to improve instruction and elevate the achievement of Connecticut's students. The test results are reported in a manner that identifies how well each student is succeeding in relation to clearly-defined and meaningful standards. Educators throughout the state will use the results as a tool to gain a better understanding of the learning occurring in the classroom and ways to increase learning in the future.	In order to implement the Connecticut Mastery Test, teachers provide instruction in all three areas. Through the writing process students develop their planning and communication skills. Attention is directed to the organization and elaboration of supporting ideas. In mathematics students use calculators to develop their ability to work on multi-step problems. In reading students are encouraged to monitor their understanding of text and make appropriate inferences and judgements.	SEA reported that through the Mastery Test initiative there is a special effort currently underway to improve student thinking and learning specifically in the middle grades. The state reported that Mastery Test serves grades K-12 but targets grades 4, 6, and 8.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	This program is implemented statewide as all colleges and universities must assure that their graduates are able to exhibit critical thinking competencies. During the first year of employment, under a Connecticut Initial Certificate, the new teacher receives support from a trained mentor and is assessed onsite by six trained assessors to ensure that s/he is incorporating these competencies into instruction.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Delaware		
Previous state instructional initiative, the Thoughtful Classroom.	The initiative was called the Thoughtful Classroom and was originally implemented in 1988. The grade levels participating in the program were K-12. The state reports only 20% of students were served. The initiative targeted all disciplines and incorporated elements such as teacher and student behavioral roles within the classroom. Thoughtful Classroom was integrated throughout all grade levels and teachers were trained through special modules to provide thinking skills to their students. The program was not targeted to any special needs group of students. Though no longer a state board goal, activities continue at the local level.	No information regarding funding to this initiative was reported.
District of Columbia		
No state or local critical thinking initiative(s) reported.		
Florida		
State curriculum/instructional and middle level initiative, Florida progress in Middle Childhood Education.	The progress in Middle Childhood Education Program (PRIME) initiative requires each school district to include provisions for teaching critical thinking skills in the context of the basic skills. All students in grades 4-8 are targeted and served. The academic disciplines involved in this initiative include: (for grades 4 and 5) mathematics, language arts, science, art, music, and social studies and (for grades 6-8) mathematics, communications (reading, writing, and speaking), science, and social studies. PRIME was implemented based on an extensive study of "The Forgotten Years". This study identified the urgent need for critical changes in the structure, organization and methods for delivering instruction. The program is incorporated into regular subject instruction. This initiative was implemented in the 1986-1987 school year.	The SEA contributed $40,000,000 to this initiative. Amounts distributed are based on the Florida Education Funding Program.

Impetus	Goals	Implement	Middle
The impetus for this initiative came from the Delaware General Assembly and the Department of Public Instruction, which shared a concern to make higher order thinking skills a part of every student's learning. The demands of everyday living and those of industry and business require people who can think critically, solve problems and make decisions.	The goal was to train all teachers and administrators in the elements of classroom activity which can support improved student thinking. Two distinct purposes were identified: (1) to gain information from a variety of sources as to the level of involvement of Delaware schools in the teaching of higher order thinking to all students and (2) to develop awareness and support for the teaching for higher order thinking to all children.	The Thoughtful Classroom initiative was state-sponsored and began in December of 1988.	This initiative does not specifically target the middle grades.
PRIME was implemented based on an extensive study (See report *The Forgotten Years*) which identified the urgent need for critical changes in the structure, organization and methods for delivering instruction to young adolescents in Florida in order to insure their success in high school and their successful entrance into adult society.	The goal for PRIME is to assure that all students have an appropriate program of instruction to enhance their ability to think critically and development to their maximum potential.	No specific implementation program, however, the state reports that in order to receive PRIME middle school funds, a district must submit an annual plan to the Department of Education for approval. All appropriate requirements and enhancements must be addressed. District programs are monitored on a regular basis for compliance and achievement of program objectives.	This initiative specifically targets middle grades.

State/Type	Summary	Funding
Georgia		
State curriculum initiative, Implementation of Quality Core Curriculum.	The Quality Core Curriculum initiative identifies critical thinking skills across all subject areas and encourages an interdisciplinary approach to learning. The state reports that all students in the state are served by this initiative. The "writing process" is promoted as an instructional tool for thinking skills. A state writing assessment at grades 6, 8, and 10 reinforce the application of the initiative. The goals of this initiative include: instructional improvement throughout Georgia; equality in educational opportunities for all students; and student graduation with improved application and mastery of communication and reasoning abilities. Critical thinking skills are incorporated in all subject areas.	The SEA contributes funding to this initiative from the state legislature. The amount of contribution was not reported.
Georgia		
State middle grades initiative, Middle School Incentive Grant	Middle School Incentive Grant initiative provides additional planning for core teaching teams to meet the individual needs of students. Interdisciplinary planning focuses teaching on critical thinking/study skills. Planning efforts incorporate exploratory learning and improve instruction focusing on higher intellectual skills.	No information regarding funding of this initiative was reported.
Hawaii		
State in-service training initiative "Basic Academic Skills Improving through Core Subjects" (BASICS).	Basic Academic Skills Improvement through Core Subjects (BASICS) focuses on strategic and collaborative curriculum planning, teaching and learning processes across disciplines. The instructional focus includes the infusion of critical thinking skills into subject areas such as language arts, mathematics, social studies, science, and Asian, European and Pacific languages. The initiative targets teachers in grades K-12 in seven districts statewide. This program has been incorporated into the regular subject instruction and was developed to teach students basic and higher order skills, including problem solving, decision making, reasoning, and other higher order learning. An important part of the program has been the modelling of collaborative, interdisciplinary curriculum planning and teaching. The effective date of implementation was August, 1987.	The SEA contributes $110,000 per year to this initiative.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	Georgia reports the following goals: instructional improvement throughout Georgia; equality in educational opportunities for all students; and improved application and mastery of communication and reasoning abilities by all graduates.	Implementation is a result of mandate by state law. The initiative is also related to statewide student assessment program and required as a framework for the development of curriculum.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goals for this initiative was reported.	No information regarding the implementation of this initiative was reported.	This initiative specifically targets the middle grades.
BASICS was developed to address the relatively low student achievement scores in reading comprehension and mathematics. The program emphasizes student acquisition of the traditional as well as the "new" (i.e., higher order) basic skills including problem solving, decisionmaking, reasoning, and learning to learn (metacognition). Language across the curriculum and collaborative learning strategies are also used to enhance learning.	The goal of this initiative is to ensure that students will be taught basic and higher order skills including problem solving, decisionmaking, reasoning, and learning to learn (metacognition). Basic skills, moreover, would be reinforced across the curriculum.	SEA implements this initiative through the in-service training conducted by Instructional Services throughout the school year and summer in each school district in the state. District staff, as well as state staff, provide follow-up technical assistance as requested to the schools involved in the project. During the school year, substitute teachers are provided as needed.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Idaho		
No local or state critical thinking initiative(s) reported.		
Illinois		
Previous state in-service training initiative, "Skills Essential for Learning."	"Skills Essential for Learning" provided workshops throughout the state during school years 1985-86 and 1986-87. The program was designed to facilitate and encourage the direct teaching of critical thinking skills throughout the curriculum. Subsequent training is currently provided through the state's 18 Education Service Centers. Their trained staff provide technical assistance to local education agencies as needed. Students in K-12 are served in every academic discipline. The program is incorporated into subject instruction and the SEA reports that it does not serve any special needs group.	No information regarding the funding for this initiative was reported.
Illinois		
State in-service training initiative, "Gifted Education: Administrator and Teacher In-service Training."	The Gifted Education initiative serves teachers of K-12 students in gifted education programs. The SEA reports that all academic disciplines may be involved in this initiative. The organization of critical thinking initiatives varies from school district to school district according to need and availability of resources. General critical thinking strategies or skills in deeper content in subject disciplines may be taught at all grade levels. The use of creative or divergent thinking skills are included as one of the specific aptitudes defining gifted children in Illinois. Gifted Education was initiated in the 1970's and continues throughout the state at local and regional sites and at the annual state conference on gifted education. The goal is to infuse thinking skills throughout the curriculum at a level commensurate with the potential of the gifted child.	No information regarding the funding for this initiative was reported.
Illinois		
Local curriculum/instructional initiatives under the state's Urban Education Partnership Grant.	Urban Education Partnership Grant is an initiative for schools to develop programs that support improved academic achievement of students. This grant is obtained by local schools through a competitive process. The Partnership Grant funds over 40 programs; several programs emphasize teaching critical thinking.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	The goal of Skills Essential for Learning was to facilitate and encourage the teaching of critical thinking skills throughout the curriculum.	Workshops for implementation were held throughout Illinois in the 1985-86 and 1986-87 school years. Subsequently, staff of Educational Service Centers were trained in the project and have continued to provide assistance to school districts as needed. Resources were available from the State Board of Education.	This initiative does not specifically target the middle grades.
Gifted Education was initiated in the 1970's and continues throughout the state at local and regional sites, and is also promoted by the annual state conference for gifted education.	The goal of Gifted Education is to infuse thinking skills throughout the curriculum at a level commensurate with the potential of the gifted student.	Implementation occurs through the Educational Service Centers (ESCs). Training workshops use external consultants. Districts may use combinations of ESC services and consultants for the in-service training of staff who are expected to adapt these skills and incorporate them into the gifted classroom.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding the implementation of this initiative was reported.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Illinois		
Local instructional initiative under the state's "Alliance of Essential Schools".	The Alliance currently involves 10 schools and will expand during the 1990-91 school year to include 21 schools. The focus is for students to "learn to use their minds well." The SEA reports that the program's design should be shaped by the intellectual and imaginative powers and competencies students need, rather than by "subjects" conventionally defined.	No information regarding the funding for this initiative was reported.
Indiana		
Pending state curriculum initiative by the state's restructuring task force. State assessment initiative, ISTEP.	Indiana reports that planning by the restructuring task force will incorporate and disseminate programs on thematic learning, interdisciplinary middle school programs, and intensive mathematics instruction. Indiana also reports a testing program (ISTEP) which is based upon "proficiencies" and accent "thinking skills." Indiana has a middle school task force that is examining curricular reform. State provides no details of middle school task force.	No information regarding the funding for this initiative was reported.
Iowa		
State technical assistance initiative, Assessing Thinking Skills.	Assessing Thinking Skills is a state technical assistance initiative which provides guides to local districts regarding assessment of thinking and other higher order skills. The state reports that regardless of whether skills are integrated into each discipline or taught separately, multiple assessment procedures to measure thinking should: be consistent with educational objectives; go beyond the mere recall of facts and information; include a variety of performance tasks, oral as well as written; embrace test items which may have several acceptable responses; provide feedback to the teacher indicating that the learner lacks factual information or has knowledge but fails to apply it; focus on processes in addition to covering content; encourage small groups to work together to resolve specific problems; utilize situations and problems within the classroom and from the environment outside of school; provide a variety of test experiences; examine achievement related behaviors such as openness, persistence, cooperation and motivation; and look for unanticipated outcomes. The grades targeted are grades 5-12. State reports that most of the academic disciplines are involved in Assessing Thinking Skills.	The SEA contributes funding to this initiative. The amount of contribution was not reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding the implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
No information regarding the impetus was reported.	No information regarding the goals of this initiative was reported.	No information regarding the implementationn of this initiative was reported.	The middle school task force focuses on curricular reform of the middle grades.
Guidelines for Assessing Thinking Skills were developed to provide assistance to LEAs in assessing thinking skills outcomes.	The goal is to provide guidance to LEAs in assessing thinking skills outcomes.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Iowa State curriculum initiative, A Guide to Developing Higher Order Thinking Across the Curriculum.	"A Guide to Developing Higher Order Thinking Across the Curriculum" synthesizes the varied and not always consistent ideas about thinking into an approach that will be useful to Iowa educators as they work to infuse higher order thinking into their teaching. The goal is to give educators a sense of: what is meant by higher order thinking skills, what its components are, some teaching strategies for developing this thinking in students, and some ways of assessing to what extent a district's instruction and curriculum promote growth in student thinking. State reports that all academic disciplines are included in the initiative with the intent to incorporate the critical thinking skills in the regular subject instruction. Grades K-12 in both public and private schools are targeted in this initiative.	The SEA contributed $10,000 (for initial guide development) to this initiative.
Iowa State in-service/technical assistance initiative to provide guidance to local education agencies in assessing student achievement outcomes.	This initiative provides guidance to local education agencies to assess student thinking skills. According to the SEA, whether skills are integrated into each discipline or taught separately, multiple assessment procedures to measure thinking should: be consistent with objectives; go beyond the mere recall of facts and information; include a variety of performance tasks, oral as well as written; embrace test items which may have several acceptable responses; provide feedback to the teacher indicating that the learner lacks factual information or has knowledge but fails to apply it; focus on processes in addition to covering content; encourage small groups to work together to resolve specific problems; utilize situations and problems within the classroom and form the environment outside of school; provide a variety of test experiences; examine achievement related behaviors such as openness, persistence, cooperation and motivation; and look for unanticipated outcomes. The grades targeted by this initiative are grades 5-12 while the students served are only in selected districts that were actually involved in the explicit teaching of thinking. State reports that most of the academic disciplines are involved in Assessing Thinking Skills. The purpose of this initiative was to provide guidance to LEA's in assessing thinking skills outcomes. A number of districts requested assistance in evaluating student achievement outcomes.	The SEA contributes funding to this initiative. The amount of contribution was not reported.

Impetus	Goals	Implement	Middle
State reports that the impetus is derived from the Iowa Excellence in Education Task Force report.	State reports that the goal is to provide educators with answers to the following: what is meant by higher order thinking, what are its components, what are some teaching strategies for developing this thinking in students, and what are some ways of assessing student growth.	This initiative was implemented in July, 1989.	This initiative does not specifically target the middle grades.
Guidelines for Assessing Thinking Skills was initiated to provide guidance to LEA's in assessing thinking skills outcomes.	The goal is to provide guidance to LEA's in assessing thinking skills outcomes.	No information regarding implementation of this initiative was reported.	This initiative does specifically target the middle grades.

State/Type	Summary	Funding
Kansas		
State assessment initiative, Mathematics Improvement Program.	Mathematics Improvement Program, through staff development activity and changes in student assessment, aims at modifying instruction to include problem solving, general critical thinking skills, deeper content, and analytical thinking. The program is supported by state assessment monies and federal funds, and serves all students in grades K-12 in mathematics. The initiative is not targeted to any special needs groups.	The SEA contributes $100,000 to this initiative.
Kentucky		
Pending staff development initiative will include four areas of staff development.	The Kentucky Office of Instruction is in the process of planning a staff development initiative for critical thinking. This plan includes four areas of training: awareness, planning, initial implementation, and advanced implementation. The sessions will be applicable to all students, K-12, and will promote the infusion of thinking skills into the content areas. (Content areas are: language arts, mathematics, science, social studies, health and fitness, arts and humanities.) The committee includes personnel from Curriculum and Staff Development, Compensatory Education, Exceptional Children, and the Office of Planning.	No information regarding funding to this initiative was reported.
Kentucky		
Pending state instructional/curriculum initiative, Program of Studies for Kentucky Schools.	The pending initiative, Program of Studies for Kentucky Schools, will provide administrators and teachers in local districts with a basis for establishing and revising curriculum. This program integrates critical thinking skills into classroom curriculum in grades K-12 and targets disciplines including: mathematics, science, social studies, health and fitness, arts and humanities, and computer and technology. Special needs students are not specifically targeted by this program.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
State reports impetus to be State School Board's Strategic Directions.	State reports goal to be tied to the State School Board's Strategic Directions.	Mathematics Improvement Program was implemented into all regular math instruction in a number of ways. The program incorporated staff development to assist teachers in acquiring additional teaching skills and techniques in mathematics. The initiative also involves a review of existing teacher education programs and certification requirements for teaching mathematics. Program evaluation will occur as part of the redesign of school accreditation based on performance outcomes. The program was initiated in December, 1989.	This initiative does not specifically target the middle grades.
Kentucky Education Reform Act, HB940, 90 RS BR 4645/EN-Goal #5 of this legislation is the impetus for the staff development initiative: "Develop students' ability to think and solve problems both in school situations and in a variety of situations they will encounter in life."	The goal of the staff development initiative is to promote the infusion of critical thinking into all disciplines by training teachers to incorporate critical thinking instruction.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
The impetus for this initiative was Executive Order 89-151 by the Council on School Performance Standards for the Kentucky Education Reform Act which delineated six goals for instruction.	The goals of this initiative is to provide administrators and teachers in local districts a basis for establishing and revising their curriculum emphasizing improved student thinking.	Implementation is initiated at the local level as teachers and administrators use mandated guidelines to make necessary changes in instruction and curriculum to advocate critical thinking skills.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Louisiana		
No local or state critical thinking initiative(s) reported.		
Maine		
State assessment initiative, Maine Educational Assessment program.	The Maine Educational Assessment (MEA) is conducted annually in grades 4, 8, and 11 and encompasses reading, writing, mathematics, science, social studies, and humanities. The assessment emphasizes critical thinking skills in all subjects. State reported that the Maine Educational Assessment was initiated by the Governor's Commission on the Status of Education in Maine and implemented as part of the Educational Reform Act of 1984. That legislation called for a comprehensive set of reforms directed toward school improvement. The assessment program is administered by the Division of Educational Assessment of the Department of Educational and Cultural Services, with the cooperation of the Division of Curriculum and the Division of Special Education. The Maine Educational Assessment Program began in 1985.	The SEA contributes approximately $1 million to this initiative.

Impetus	Goals	Implement	Middle
State reported that the Maine Educational Assessment was initiated by the Governor's Commission On the Status of Education in Maine and implemented as part of the Educational Reform Act of 1984. That legislation called for a comprehensive set of reforms directed toward school improvement.	The goals of the Maine Educational Assessment are (1) to provide information on the academic achievement and progress of Maine students; (2) establish a process for continuing evaluation of state educational goals and aid in the development of educational policies, standards, and programs; (3) provide school officials with information to assess the quality, effectiveness and appropriateness of educational materials, methods, and curriculum needs, including remediation and enrichment; (4) provide school staff with information about individual students which may be used, with other information, to meet individual educational needs of the student; (5) identify year-to-year trends in student achievement; and (6) provide parents with information about the achievement of their children on the assessment tests.	The assessment program is administered by the Division of Educational Assessment of the Department of Educational and Cultural Services, with the cooperation of the Division of Curriculum and the Division of Special Education. At various times during the year, the contractor for the assessment contacts superintendents and building principals to collect the information necessary to conduct the testing. The tests are designed to be administered by teachers and require a total testing time of approximately five to six hours divided among several separate testing sessions. State, school district, and individual school results are published, including specific information related to the cognitive level of the understandings and skills assessed.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Maine		
Regional Curriculum Networks.	The Regional Curriculum Networks are regular meetings in locations around the state to help educators keep up with current research and literature in business education, consumer and home economics, early elementary education, fine arts, foreign languages, guidance, health education, industrial technology, language arts/reading, mathematics, middle level education, physical education, science and social studies. The networks help educators keep abreast of important changes at the local and national levels regarding educational innovations. It also provides a forum for issues and concerns, such as curriculum development, parent-school relationships and appropriate practices in the classroom. The Regional Curriculum Networks were implemented in 1987.	The SEA contributes funding to this initiative. The amount of contribution was not reported.
Maine		
Seminars in Critical Skills Program for teachers.	Critical Skills Summer Institutes have been in operation since the summer of 1982 and have trained hundreds of teachers from dozens of school districts in the New England area. They were originally started and managed as a joint business/education partnership. The operation of these Institutes has been under the management of the Critical Skills Program at Antioch/New England Graduate School in Keene, New Hampshire since 1986. The Institute is an intensive six-day training experience that targets the teaching of Critical Skills (problem solving, decision making, critical thinking, communication, organization, cooperation, collaboration, management, leadership, and independent learning) as an integral part of instruction. It focuses on the classroom strategies that most effectively facilitate the development of these skills in students within the demands of a given curriculum. The State Department of Education initiated this program by convening a board to examine opportunities for learning critical thinking skills. As a result, the Critical Skills Program was brought to Maine in the summer of 1989. The program has grown to seven seminars.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	State reported the goal of the Regional Curriculum Networks is to keep educators abreast of current research and literature as well as knowledgeable about state of the art practices.	Three times per year, Regional Curriculum Network meetings are held throughout the state. Districts voluntarily send teams of educators or other individuals. Knowledge gained at these RCNs is then taken back to school administrative units.	The Regional Curriculum Networks are not targeted specifically at the middle level, however, middle level education is one of the particular topics addressed in the networks.
The impetus evolved from the need to teach the critical skills of problem solving, decision making, critical thinking, communication, organization, cooperation, collaboration, management, leadership, and independent learning. These skills have been identified as "critical" by professional and lay people, and in studies from independent research groups, colleges, and universities. The direct impetus for this effort was action by the SEA to convene a board to examine opportunities to improve the teaching of thinking skills.	State reported the goal of this initiative is to offer to all educators the opportunity to participate in the Critical Thinking Skills Program.	The operation of the Critical Skills Institutes has been under the management of the Critical Skills Program at Antioch/New England Graduate School in Keene, New Hampshire since 1986. The Institute has an intensive six-day training experience that targets the teaching of Critical Skills as an integral part of instruction.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Maryland Previous state in-service/technical assistance initiative, Statewide Thinking Skills Conference	Statewide Thinking Skills Conference was a series of seven statewide critical thinking conferences sponsored by the state October, 1984 through May, 1989. The conferences involved educators from all subject areas representing pre-K through university level. The Thinking Skills Program emphasized the development of students' thinking skills within the context of regular subject instruction. The conferences were designed to raise awareness among educators of the importance of developing students' thinking abilities and to stimulate the development of thinking skills initiatives in local school systems by providing current information regarding issues, approaches, and programs.	The SEA contributed $32,000 to this initiative.
Maryland State incentive grant initiative, Thinking Improvement Planning Grants.	State incentive grant program includes two phases: (1) phase one, Thinking Improvement Planning Grants, and (2) phase two, implementation of the proposed demonstration. Thinking Improvement Planning Grants provide funds to support the formation of district planning committees. These groups involved interested teachers, administrators, supervisors, and occasionally, parent representatives. They met on a regular basis to survey the literature, explore issues, review programs, formulate goals, and develop plans for a pilot project. Nineteen of Maryland's 24 districts applied, and all received planning grants. The program targets the subjects of math, reading, biology and computers for all grade levels.	The SEA contribute $125,000 to this initiative.
Maryland Pending state assessment initiative for Criterion-Referenced Testing Program/Learning Outcomes.	The Criterion-Referenced Testing Program/Learning Outcomes is a pending initiative that proposes to focus on students' use of higher-order cognitive skills and on school performance. The following alternative exercise types are encouraged throughout testing program: short, extended and open-ended questions; performance tasks; other alternative assessment modes/procedures (e.g., videotapes, oral interviews, portfolios). The assessment will target grade levels 3, 5, 8 and 11 and includes a mathematics and an integrated reading-writing/language usage, science and social studies component for each grade level. The Learning Outcomes will specify what students should know, be able to do, and how they should act as a result of their educational experiences. The Learning Outcomes will be used in developing the new criterion-referenced assessments.	The SEA contributes $540,000 to this initiative.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	State reported that the goal for the Thinking Skills conference series was to raise awareness among educators of the importance of developing students' thinking abilities and to stimulate the development of thinking skills initiates in local school systems by providing current information regarding issues, approaches, and programs.	Local school systems used information obtained from the conferences in implementing local school thinking skills programs and in offering staff training workshops for teachers.	This initiative does not specifically target middle grades.
No information regarding the impetus for this initiative was reported.	State reported that the goal for the Incentive Grants Program is to support the formation of district planning committees to pilot thinking skills projects.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
In 1987, the Governor appointed a Commission on School Performance which made its recommendations in a report. A major feature of this report was the creation and implementation of criterion-referenced assessments for school improvement purposes.	The goal of this initiative is to shift from a curriculum and procedures which foster proficiency with paper and pencil skills to one which emphasizes conceptual understandings, multiple representations and connections, modeling and problem solving.	The Maryland State Department of Education is requesting proposals for the design, development, census administration, field testing, scaling, and scoring of state-of-the-art criterion-referenced achievement assessment instrumentation. Proposals must relate to the development of a battery of tests to include a mathematics and an integrated reading-writing/language usage component for each of three grade levels: 3, 5, and 8. There will be a Pre-Proposal Conference.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Massachusetts		
Statewide assessment initiative, On Their Own: Student Responses to Open Ended Tests in Math, Science, Reading, and Social Studies.	This assessment initiative tests students' ability to respond to open-ended questions which require them to analyze, critique, organize and generate responses. This initiative began in 1986. Approximately 1/20 of all 12th grade students, 1/16 of all 8th grade students, and 1/10 of all 4th grade students take the open-ended assessment measures. The results of these exams are used to (1) supplement the information gained from more conventional testing programs; and (2) encourage teachers' ability to evaluate their students' progress in a more valid and instructionally useful manner.	The SEA contributes funding through its assessment budget. The amount of contribution was not reported.
Massachusetts		
Middle school curriculum initiative, Solutions Unlimited computer software/video package.	Solutions Unlimited: Computer Software/Video Package is an eight-unit series for middle school students. This series pairs the television program *Think About* with computer software and teaches students to approach problem-solving systematically. The video segments of this series present problems for students to solve and the computer software programs help them to explore alternative solutions using varied computer applications.	State reported that funding for this initiative was provided through the Massachusetts Executive Committee for Educational Television Trust Fund.
Massachusetts		
Teacher grant program.	The Horace Mann Teacher Program grants are awarded to compensate teachers who take on expanded responsibilities within their schools or districts. Such responsibilities include but are not limited to: teacher training, curriculum/program development, assistance to dropouts/potential dropouts, inservice instruction and consultants, development/evaluation of teaching resources, and school-home-community liaison. The program's purpose is to provide financial incentives to qualified teachers to encourage the use of valuable teaching resources. During the 1989-90 school year, several Horace Mann teachers chose to develop projects dealing with critical thinking skills and problem-solving techniques.	The SEA contributes through the Horace Mann Teacher Program to this initiative. The amount of contribution was not reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	The goals of this initiative are to (1) supplement the information gained from more conventional testing programs; and (2) encourage teachers' ability to evaluate their students' progress in a more valid and instructionally useful manner.	The On Their Own assessment initiative was implemented by providing the test to a random sampling of 4th, 8th, and 12th grade students in a matrix-sampled assessment. The results are aggregated at the state level and then distributed to all schools, districts, and curriculum coordinators within the state and are available for duplication by classroom teachers.	This initiative does not specifically target the middle grades.
The impetus for this initiative came from a recognition within the SEA of the need to teach students to approach problem-solving systematically.	The goal of this initiative is to teach students to approach problem-solving systematically.	State reported that the video/software for the Solutions Unlimited initiative is available to schools through the Massachusetts Department of Education. Schools and districts will have unlimited duplication rights once they have purchased the package.	This initiative specifically targets the middle grades.
No information regarding the impetus for this initiative was reported.	The goal of this initiative is to improve the quality of instruction through incentives to teachers.	State reported that Horace Mann Teacher Program grants are made to teachers who take on added responsibilities within their schools or districts.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Massachusetts		
State in-service training initiative.	The Curriculum Seminar Series, sponsors over 100 seminars to teachers and administrators. The goals of the seminar series are (1) to provide technical assistance to teachers and administrators, (2) to encourage school personnel to think about their school as a locus for change and reform, and (3) to explore current research in the fields of teaching and learning. Several seminar topics focused on higher level thinking skills and problem-solving. For example, Teaching Bloom's Taxonomy to Kids, Problem-Solving in Mathematics, Math Think: Critical Thinking in Elementary Mathematics, and Teaching Critical and Creative Thinking in the Context of Your Classroom Curriculum.	No information regarding funding to this initiative was reported.
Michigan		
State promotion/instructional initiative, Position Paper on Thinking Skills.	"Position Paper on Thinking Skills" acknowledges a variety of definitions and methodologies with respect to higher order learning. Through this promotional activity, the state encourages local districts to initiate activities that develop and promote students' higher order thinking skills. It is used at the discretion of local education agencies. The initiative serves all students in every grade level, and targets all subject disciplines. It was designed to stimulate local districts to establish a thinking skills program as a priority for their students. The initiative was implemented in 1987 and does not specifically target special needs students.	No information regarding funding to this initiative was reported.
Michigan		
State curriculum/assessment initiative, Michigan State Board of Education Essential Goals and Objectives for Science K-9.	Michigan State Board of Education Essential Goals and Objectives for Science initiative serves grades K-9. The assessment initiative focuses on grades 3, 6, and 9. The targeted discipline is science. The initiative encourages the development of the following skills: observation/identification; classification; measurement; sequencing/ordering; informing; prediction; communication; interpretation; investigation; controlling variables. These elements are incorporated into regular instruction through a process of introduction, development, reinforcement, and testing. The program is incorporated into regular classroom instruction, and does not specifically target special needs students.	The SEA contributes $139,000 per year to this initiative.

Impetus	Goals	Implement	Middle
No information regarding the impetus of this initiative was reported.	The goals for the Curriculum Seminar Series are (1) to provide technical assistance to teachers and administrators, (2) to encourage school personnel to think about their school as a locus for change and reform, and (3) to explore current research in the fields of teaching and learning.	State reported that the Curriculum Seminar Series sponsored more than 100 seminars free of charge to school personnel and administrators during the 1989-90 school year.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	The goal of this initiative is to stimulate activity in local districts to establish thinking skills as a priority.	Initial implementation of this initiative began in 1987 which attempted to help Michigan's students and teachers share a vision, "Michigan's Students Can...Because They Think." Badges and posters were made to exhibit this vision.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Michigan		
State instructional/assessment initiative, Essential Goals and Objectives for Reading Education.	Essential Goals and Objectives for Reading Education emphasizes student performance of reading (metacognition) which employs higher levels of thinking including inference, prediction, and the ability to hypothesize. This initiative serves all students in grades K-12 and targets grades 4, 7, and 10 for assessment. This initiative does not specifically target special needs students groups.	The SEA contributes $350,000 per year to this initiative.
Michigan		
Two state curriculum/instructional initiatives: Essential Goals and Objectives for Computer Education, and Essential Goals and Objectives for Social Studies.	Two initiatives—Essential Goals and Objectives for Computer Education, and Essential Goals and Objectives for Social Studies—both serve all students in grades K-12. All disciplines are included in the computer education initiative. The computer initiative uses generic thinking skills identified as Theory Computer. The goal of this initiative is to understand how computer-related tools can be used for problem solving. The Essential Goals and Objectives for Social Studies teaches thinking skills specifically in the context of the social studies curriculum. Special needs students are not specifically targeted by either of these initiatives.	The SEA contributes $8,000 to this initiative.
Michigan		
State instructional/assessment initiative Essential Goals and Objectives for Mathematics Education.	Essential Goals and Objectives for Mathematics Education serves students in grades K-12, targeting grades 4, 7, and 10. The initiative includes an effort to support higher order skills in mathematics by focusing math assessment on those skills. The goal of this initiative is to determine state progress toward the improvement of mathematics education. Special needs students are not specifically targeted by this initiative.	The SEA contributes $300,000 per year to this initiative.

Impetus	Goals	Implement	Middle
The Michigan State Board of Education Essential Goals and Objectives for Reading was initially developed and overhauled in the mid 1980's as a response to current research on reading comprehension.	This initiative seeks to improve student performance in reading by increasing students' metacognitive skills including inferential reasoning, predicting, and hypothesizing.	In May of 1986 Michigan initiated this statewide assessment program in reading.	This initiative does not specifically target the middle grades.
The impetus for the computer education effort is that technology is a powerful driving force for educational change. No impetus was reported for the social studies initiative.	The goal of the computer education initiative is to understand how computer-related tools can be used for problem solving. The goal of the social studies curriculum/instructional initiative is to guide and influence social studies curriculum in local districts to incorporate an emphasis on thinking skills.	The Essential Goals and Objectives for Computer Education was published and disseminated in the spring of 1987 to all local districts. Regional workshops train educators in content and instruction. They are encouraged to use this as a guide when developing curriculum and instruction. Similarly, The Essential Goals and Objectives for Social Studies was published and disseminated in August of 1987 to all local school districts. Regional workshops familiarize educators with its content and implications for curriculum and instructional reform.	This initiative does not specifically target the middle grades.
No information regarding the impetus of this initiative was reported.	The goal of this initiative is to determine state progress toward the improvement of mathematics education.	Michigan's assessment of mathematics began in the early seventies with a criterion-reference test as a means for determining the state progress toward improving mathematics education. This initiative impacts classroom regional workshops and allied documents providing analysis and instructional support.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Minnesota		
State curriculum initiative, Home Economics Curriculum Project which includes a problem-solving model.	The Home Economics Curriculum Project includes a problem-solving model developed around three themes including: raising and expanding awareness of issues, conditions, and concerns; identification of related problems; and achievement of basic human goals. Two conceptual frameworks provide the overall structure for this curriculum model. They address discrepancies between basic human goals and existing social and economic conditions, and related responsible action. These frameworks are used as guides for identifying broad human goals, and the practical reasoning processes necessary for critically solving problems. In conjunction with three Minnesota universities, the SEA provides curriculum, teaching examples and in-service training for teachers statewide. This initiative serves all students enrolled in home economics grades 5-12. Initial implementation began in 1980-81. Special needs students are not specifically targeted by this initiative.	No information regarding the funding for this initiative was reported.
Minnesota		
State legislative initiative, Model Outcomes documents.	Model Outcomes documents are used by local education agencies when they review curriculum to assess whether it and combined instructional practices accomplish state mandated learner outcomes. Curriculum reviews are required at least once every 6 years. The Model Outcomes documents were developed during 1988-89 in an attempt to integrate thinking skills into the entire curriculum K-12.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
The Home Economics Curriculum Project was initiated to redirect the secondary home economics program so that needs of students in the 21st Century will be met.	The goal of the Home Economics Curriculum Project is to integrate critical thinking skills and problem-solving strategies into the home economics curriculum so that students can make decisions and apply knowledge and skills to solve problems of the home and family.	The SEA, in a combined effort with three Minnesota universities, provides curriculum, teaching examples and in-service training for teachers statewide. Two hundred home economics teachers were involved in field testing and developing instructional materials. In-service training using the curriculum examples involves 400-500 teachers annually in 8-10 sites across the state, and has been conducted over the past eight years.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported	No information regarding the goal of this initiative was reported.	The state legislature directed the SEA to develop essential learner outcomes for all major subject areas. The goal was to have a document with outcomes specified for all districts to include in their curriculum review cycles. Outcomes were not only to cover the "basic skills" but higher level thinking as well.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Minnesota		
State promotion initiative, *Thinking Through Technology*.	*Thinking Through Technology* is a state publication that provides examples of student lessons which show challenging uses of technology. *Thinking Through Technology* advocates integration of critical/creative thinking in content areas by identifying and showing the uses of various technologies as they are incorporated in the design of student activities. The SEA disseminates copies of the guide, *Thinking Through Technology* and offers training to classroom teachers through the Emerging Technology Workshop series. The goal of this initiative is to assist local agencies in the development of capable student thinkers who are self-directed learners and producers of new information. The program serves students in grades 7-12 and targets all disciplines.	The SEA contributes $10,000 to this initiative.
Minnesota		
State promotion/technical assistance initiative, *Optimizing Student Learning: A Guide to Purposeful Thinking* (1990).	*Optimizing Student Learning: A Guide to Purposeful Thinking* (1990) describes the central elements of a thinking skills programs and provide a framework for local education agencies to evaluate commercial and district-developed critical thinking programs. This initiative offers a common language and sample set of processes/skills for educators to evaluate and plan a thinking skills program. The intent of the guide was to provide an example—not a statewide thinking skills curriculum. All students in grades K-12 are served by this initiative and all subject disciplines are targeted.	The SEA contributes $10,000 to this initiative.
Mississippi		
No state or local critical thinking initiative(s) reported.		

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	The goal of this initiative is to assist local education agencies in the development of capable student thinkers who are self-directed learners. *Thinking Through Technology* is intended to provide examples of student lessons which show challenging uses of technology "beyond the electronic workbook." The lessons are designed to show how technology may be a tool for students to become producers of new information.	The SEA disseminates copies of the guide *Thinking Through Technology* and offers training to classroom teachers through the Emerging Technology Workshop series.	This initiative does not specifically target the middle grades.
The impetus for this initiative was to clarify research and instructional methodologies for educators regarding thinking skills.	This initiative is intended to provide a simple and clear picture to educators regarding the teaching of thinking skills.	The SEA disseminates copies of the guide to each school district and offers training. District or building teams develop a plan to incorporate a selection of processes/skills from the guide into their overall staff development or curriculum design process.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Missouri		
State curriculum/instructional initiative, Program of School Restructuring and Curriculum Acceleration.	Program of School Restructuring and Curriculum Acceleration is an initiative by the state education agency together with nine Missouri elementary schools which attempts to eliminate the need for remedial education through a program of school restructuring and curriculum acceleration based upon Dr. Henry Levin's accelerated schools concept. The initiative strengthens the content of instruction in targeted schools and accelerates instruction for disadvantaged students; improves school climate and empowers teachers; and institutes accountability for educational results. This initiative serves students in nine schools, grades K-6 and all academic disciplines are targeted. This initiative is incorporated into all regular subject instruction and was implemented in 1987.	The SEA contributes $124,000 to this initiative.

Impetus	Goals	Implement	Middle
The Missouri Commissioner of Education invited representatives of school districts in the state to discuss future implementation of the accelerated school intervention concept with Dr. Henry Levin.	The goal of this initiative is to reduce or eliminate the need for remedial education through a program of school restructuring and curriculum acceleration based upon Dr. Henry Levin's accelerated schools concept.	The SEA Department of Elementary and Secondary Education provides a project director who coordinates activities of mutual interest among the nine project sites; serves as a liaison with Dr. Levin and his staff at Stanford University; and provides technical assistance to school districts as they implement their individual school plans. The project director arranges inservice training opportunities for school staff members and coordinates the work of college and university based facilitator who support the program.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Missouri		
State curriculum/assessment initiative, Core Competencies and Key Skills.	Core Competencies and Key Skills which was written into Missouri Statute, requires all school districts to include state identified core competencies and key skills in their curricula and regularly assess student mastery using criterion-referenced tests. The Department of Elementary and Secondary Education systematically selects competencies and skills which involve critical thinking strategies even though some could not be tested with mass-administered standardized tests. School districts are encouraged to assess the higher order skills locally using advice from the Department of Elementary and Secondary Education. All students in grades 2 through 10 must be assessed periodically using a state approved criterion-referenced test. Students with limited English proficiency and handicapped students whose individual education plans indicate otherwise are not included in the scoring results. Elements of this initiative include statements of objectives, curriculum alignment, mastery learning, and tests for analytical understanding. The academic disciplines targeted by this initiative are English, language arts, writing, science, mathematics, and social studies including citizenship. The SEA provides in-service training throughout the year for school staff focusing on incorporating the competencies and skills into their curriculum and implementing mastery learning strategies to ensure that students are mastering the skills. The program is incorporated into regular classroom instruction, and implementation began in 1987.	The SEA contributes funding to this initiative. The amount of contribution was not reported.
Montana		
State legislative/middle level initiative, Montana Accreditation Standards, March, 1989.	Montana Accreditation Standards of 1989 includes specific language concerning the teaching of critical thinking skills to middle school students. In addition to the ten regular school subjects, critical and creative thinking was incorporated in the regular school program on July 1, 1989. Schools that incorporate a program of thinking skills document the program with curriculum guides, class schedules and other means to comply with standards. All students in grades 6-8 (and sometimes) 4-6 are served by this initiative.	The SEA contributes to this initiative. The amount of contribution was not reported.

Impetus	Goals	Implement	Middle
The Core Competencies and Key Skills initiative resulted from developmental work by the by the SEA and the enactment of Missouri's Educational Reform Legislation, "The Excellence in Education Act of 1985".	No specific information regarding the goal of this initiative was reported.	The SEA Department of Elementary and Secondary Education publishes the Core Competencies and Key Skills for all four academic subjects for grades 2 through 10. All school districts are required by statute to assess periodically student mastery of these competencies and skills. The state has developed a battery of criterion-referenced tests closely aligned with the competencies and skills. The SEA provides continuous in-service training for school staff members. In addition, the SEA annually scores a statewide sample of students' writing at several grade levels to assess the degree to which writing skills have improved.	This initiative does not specifically target the middle grades.
The SEA recognizes the unique needs of middle school students and asserts that a middle school must have the flexibility to approach instruction and teaching in a variety of ways in order to meet the intellectual, social, emotional, and physical needs of middle school students.	No information regarding the goal of this initiative was reported.	Implementation at the state and district level varies. The SEA reported specific teacher training opportunities available at the University of Montana Summer Arts Education Institute, and the Montana Summer Visual Arts Institute.	This initiative specifically targets the middle grades.

State/Type	Summary	Funding
Montana		
State legislative initiative, "Cross-Content and Thinking Skills," approved March, 1989.	Montana Accreditation Standards, Cross-Content and Thinking Skills. This dictates that "the school district shall develop curricula at all grade levels and in all program areas (disciplines) that encourage students to understand and apply thinking and problem solving skills. The curricula shall enable students to: (1) identify and define a problem; (2) learn methods of gathering, analyzing and presenting information; (3) practice logical, creative and innovative thinking and problem solving skills in a variety of situations; and (4) apply the skills of decision making and reasoning." This rule became effective in March. All students grades K-12 are served by this initiative.	The SEA contributes to this initiative. The amount of contribution was not reported.
Nebraska		
No local or state critical thinking initiative(s) reported.		
Nevada		
State curriculum/instructional initiative, Math with Manipulatives	Math with Manipulatives serves all students grades K-8 using manipulatives to emphasize mathematical problem solving and analytical reasoning in the classroom. The program is integrated into all mathematics instruction where students must use their prior knowledge and skills to solve each new problem. The initiative is targeted through other programs to aid special needs students.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
The impetus for the Montana Accreditation Standard was to make critical thinking skills and all academic disciplines interdependent. Subjects are of greatest value when they are part of an integrated program of knowledge, skills, and opportunities that challenge students.	No information regarding the goal of this initiative was reported.	This initiative is implemented at the local school district through various programs in the regular curriculum, in gifted and talented programs, in National Diffusion Network programs (e.g. Talents Unlimited, Philosophy for Children, etc.). Teacher inservice training is provided at the local level.	This initiative does not specifically target the middle grades.
The impetus of the initiative is the result of the national movement to improve mathematics instruction. The Nevada initiative is based on the belief that the use of concrete manipulatives can support higher order learning in mathematics.	The state reports that the goal of this initiative is to prepare students for the future by encouraging thinking and problem solving.	This initiative will be implemented by the SEA through three pilot sites. Ten math trainers were trained to support individual districts to incorporate new strategies into the curriculum. 15 school districts will train a team for their school site, which, in turn, will provide training to teachers. The SEA coordinates the workshops, training of trainers, and provides assistance as needed.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Nevada		
State in-service/technical assistance initiative, Voluntary Inservice Program in Critical Thinking.	Voluntary In-service Program for teachers, librarians, and administrators emphasizes teaching for problem solving, fluency, and flexibility of thought. The students served are in grades K-12. The inservice class is advertised to all school districts in Nevada. The class requires 16 hours of instruction and offers either one unit of recertification or one unit of university credit. The disciplines that are targeted by this initiative are language arts, social studies and science. Special needs students are not specifically targeted through this initiative.	No information regarding funding for this initiative was reported.
Nevada		
Pending state curriculum/instructional initiative of middle level education.	Pending initiative of middle level education recommendations to be submitted by the Middle School Task Force to the state legislature during the 1991 legislative session. The state reports that instructional elements in the curriculum model will emphasize a variety of classroom organizational patterns, including: independent study, small and large group instruction, tutorials, mentoring, cooperative-learning, appropriate educational technology, and the development of basic subject matter mastery while continuing development of basic literacy and computation skills. All students ages 10-15 years will be served by this initiative. Special needs students also are targeted by this initiative through the "Clark County, Nevada, Teaching Strategies for Thinking".	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
This initiative is in response to the national movement to improve critical thinking skills among all K-12 students.	The goal of this initiative is to bring teachers and librarians together in partnership to create learning activities for all students that, by design, involve a high level of critical thinking skills, especially in regard to research assignments.	Local districts interested in receiving training make arrangements with the instructor at the SEA. The class requires 16 hours of instruction and offers either one unit of recertification or one unit of university credit. The initiative began in September of 1988.	This initiative does not specifically target the middle grades.
This initiative evolved from the task force research and study undertaken at the direction of the Nevada State Board of Education and is a response to the full range of intellectual, physical, social and emotional needs of young adolescents, ages 10-15. It is intended to bridge the gap between childhood and adolescence and focuses on the holistic development of young people.	The goals of the recommendations forthcoming from the Middle School Task Force include: insuring success for all students; teaching a core academic program that is infused with exploratory and enrichment experiences; promoting cooperative planning and interdisciplinary teaching; creating small communities for learning; fostering cooperative as well as developmentally-appropriate competitive activities; emphasizing student independence, responsibility and self-discipline; connecting schools with communities; involving families in the education of young adolescents; and providing students with educators who are knowledgeable and prepared to teach young adolescents.	This initiative will be implemented through subsequent training of teachers and will utilize the analysis of student achievement information provided by the Nevada Improvement Project.	This initiative specifically targets the middle grades.

State/Type	Summary	Funding
New Hampshire		
Pending state curriculum/instructional initiative, recommendations regarding critical thinking forthcoming from the New Hampshire Task Force on Performance Outcomes.	The New Hampshire Task Force on Performance Outcomes is state sponsored and its goal is to outline the essential skills required of all high school graduates in such areas as critical and creative thinking, decision-making, problem solving, communication, initiative, and leadership. The state also reported that a governor's task force has a separate committee developing recommendations for what every New Hampshire high school graduate should know in the academic disciplines.	No information regarding funding to this initiative was reported.
New Jersey		
State curriculum/assessment initiative, proficiency testing program for graduation.	Recommendations regarding the need to improve New Jersey students' mastery of critical thinking skills in reading, mathematics, and writing were made by the Department of Education. It was felt that the current Grade 9 test did not sufficiently prepare students for success in the workplace and that a test assessing higher order skills was necessary. The state legislature accepted these recommendations and enacted legislation that required the development and administration of the Grade 8 Early-Warning Test and the Grade 11 High School Proficiency Test. The Grade 11 HSPT is to become a requirement for high school graduation in 1993. These tests were specified by statewide committees of educators, representatives of business and industry, citizens and others. The tests will be administered for the first time in 1990-91. Their focus is on essential critical thinking and problem solving skills in reading, mathematics, and writing.	The SEA contributes $2.2 million to this initiative.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
In 1988, the New Jersey legislature enacted legislation that requires the development of a new Grade 11 High School Proficiency Test and a new Grade 8 Early-Warning Test.	The goal of this initiative is to develop and administer annual assessments of "...progress toward mastery of the state graduation proficiency standards." Focus is on essential critical thinking and problem-solving skills in reading, mathematics, and writing.	The test specifications and sample items were developed by statewide committees of educators in 1989-90. These tests will be administered for the first time in 1990-91.	The Grade 8 Early Warning Test specifically targets the middle grades.

State/Type	Summary	Funding
New Jersey		
State curriculum/assessment initiative provides a high-school, core proficiency program.	The High School Core Course Proficiency Program targets grades 9-12 and is incorporated into regular subject instruction. It is part of a larger state effort to raise academic standards and to create equity in access to the fundamental knowledge expected of students who take certain core courses. The state seeks to accomplish this goal by establishing core course proficiency in those courses most often taken to meet high-school graduation requirements. This program was implemented in April of 1989 and does not specifically target special needs students.	The SEA contributes $100,000 to this initiative.
New Jersey		
State curriculum/instructional initiative, Gifted Education Exemplary and Demonstration Grant Program.	Since 1987 the department has operated the Gifted Education program to support LEA efforts for initiating programs and services that encourage gifted students at all grade levels to develop to their fullest potential, while addressing their social and development needs. Grant monies are used to prepare and disseminate curricular materials which incorporate critical and/or creative thinking skills in a variety of subject areas.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
In May 1986, the High School Graduation Requirements Study Panel called the establishment of student proficiency for each course. The panel recommended a "...continuous upgrading of the proficiency to make them commensurate to the high school level, coupled with systematic assessment."	The goal of this initiative is to develop core proficiency and to assess the academic proficiency generally recognized as necessary for all students in order to receive their high school diploma. The primary purpose of these tests is accountability and assurance that the same core knowledge is learned by all students.	Implementation strategies indicated in the booklet "Commissioner's Response to Recommendations of the Panel on High School Proficiency" include a plan which began in June of 1988 and will end in January of 1996. This implementation plan is a timeline of specific activities and includes state recommendations and response, decision-making by panels on curriculum and assessment, administering of actual assessment tests in math, science, English and social studies, scoring, and analysis of test results.	This initiative does not specifically target the middle grades.
No information regarding the impetus of this initiative was reported.	The State Plan in Gifted Education recommended that the SEA provide annual funding for a program that would encourage development, identification and replication of gifted education programs.	The goal of this initiative is to support district efforts to respond to the needs of academically and intellectually gifted students.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
New Jersey		
State curriculum/instructional initiative, Project PRISM	Project PRISM, A Proposal to Create a Consortium for Improving Mathematics Curriculum, Instruction, and Assessment for students in grades K-8, involves radical changes in the mathematics curriculum and instructional methods focusing on a process-oriented, problem-solving approach to teaching and learning. The program incorporates critical thinking skills into regular mathematics instruction and calls for reform of curricular and instructional methods. Implementation began in the summer of 1990. The program does not specifically target special needs students.	The SEA contributes $15,000 to this initiative.
New York		
State assessment initiative, Social Studies Program Evaluation Testing.	Social Studies Program Evaluation Testing details procedures to assess school progress toward the attainment of higher order thinking skills within the subject areas. All students in grades 6 through 8 are targeted by the assessment and are tested on content, concepts and skills accumulated from K-8 in the discipline of social studies.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
This initiative is in response to national and international studies of mathematics achievement concluding that American students at all grades perform significantly below their counterparts in most other industrialized nations. The overwhelming majority of American students do not reach a level of mathematics achievement necessary to remain competitive in an increasingly complex and technological society.	No information regarding the goal of this initiative was reported.	Project PRISM began as part of a curriculum reform. Districts were selected from volunteers for participation in the program. Math teachers receive in-service math training and demonstration lessons. The program is partially supported by participating districts by way of annual fees, increased time allotment for mathematics instruction, informing parents about the program, providing in-service training to math teachers, and involving principals and other administrators in the planning and execution of activities. Program implementation and outcomes are being assessed.	This initiative does not specifically target the middle grades.
The Social Studies Evaluation Testing is a response to the need to improve the overall quality of instruction in social studies in the state's elementary schools. Designed to assess the overall objectives of the state's recommended curricular program for grades K-6 and for 7-8, the instruments utilize methods of assessment that allow students to demonstrate how well they have met the program's overall goals and objectives.	The goal of the Social Studies Evaluation Testing is to design innovative instructional programs in social studies that incorporate a full range of thinking skills.	School districts are required to administer the program evaluation instruments to all sixth and eighth graders in May of each year. School results in the form of means and percentiles are then reported to the superintendent who must make them public during the following school year.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
New York		
State assessment initiative, Elementary Science Program Evaluation Test (ESPET).	Elementary Science Program Evaluation Test (ESPET) is a hands-on student performance assessment program composed of seven instruments and requires students to conduct five different investigations manipulating equipment and report their results in writing. The purpose of the assessment is two-fold: (1) to provide data to help local educators make decisions to improve their elementary science program or maintain high quality programs, and (2) to help the state determine the extent to which local elementary science programs are functioning successfully and to determine where state technical assistance may be needed. The assessment is administered to all public and non-public grade 4 students. The only students not included are special education students whose individual education plan specifically states that they would not take such assessments, private schools that are exempt from any state testing, and any student absent on the day of testing, unless the school personnel wants to conduct a make-up on a following day. This inquiry assessment program encourages local elementary science programs to include the use of instruction that support problem solving.	The SEA contributed funds through the Division of Educational Testing to this initiative. The amount of contribution was not reported.
New York		
State instructional/technical assistance initiative, Regents Challenge for Excellence in Middle-Level Education Program.	Regents Challenge for Excellence in Middle-Level Education Program promotes the use of instructional techniques and processes that capitalize on the unique developmental characteristics and individual needs of early adolescents. The educational program should emphasize and promote critical learning skills including information-gathering skills, thinking skills and decision-making skills. All academic disciplines are involved. The school decides whether critical thinking skills will be integrated or separated with the regular instruction classroom.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
The manipulative assessment component to the Elementary Science Program Evaluation Test was created to evaluate the hands-on experimentation and problem solving, and evaluate some of the elementary science outcomes. Performance testing is more appropriate to evaluating outcomes that cannot be adequately assessed by paper-pencil tests.	The purpose of the assessment is two-fold: (1) to provide data to help local educators make decisions that can improve their elementary science program or maintain high quality programs, and (2) to help the state determine the extent to which local elementary science programs are functioning successfully and to determine where state technical assistance may be needed.	State reports that the staff of the Bureau of Science Education in the New York State Education Department created the Elementary Science Program Evaluation Test (ESPET) with the assistance of field consultants. After ESPET was developed, the bureau staff trained 93 regional turn key trainers from various regions of the state. These trainers replicated the training workshops in their own regions to teach elementary science mentors how to establish, administer, score, and report results.	This initiative specifically targets the middle grades.
The impetus for Regents Challenge For Excellence in Middle-Level Education Program was a concern by the Regents about the need for changes regarding education of early adolescents.	The goal for the Regents Challenge For Excellence in Middle-Level Education Program is to provide a better educational experience to middle grade students.	No information regarding implementation of this initiative was reported.	This initiative specifically targets the middle grades.

State/Type	Summary	Funding
New Mexico		
State instructional initiative, The Re:Learning Project.	All students grades K-12 in 25 districts participate in the Re:Learning Project. The program is integrated in all subject areas. Instructional practices are derived from the work of Theodore Sizer and encourage the use of questioning techniques, active participation, shared decision making and alternative forms of assessment to demonstrate mastery of subject matter. The state provides a coordinator who works with a task force to train teachers.	No information regarding the funding for this initiative was reported.
North Carolina		
State curriculum initiative, North Carolina Standard Course of Study.	The Standard Course of Study integrates general thinking skills throughout the entire curriculum. Thinking skills strategies are incorporated throughout all disciplines and grade levels. The Standard Course of Study is mandated by law. It requires school districts to reflect thinking skills in yearly plans of regional, local, and individual school improvement strategies. State and regional consultants provide technical assistance and support locally determined goals. This initiative does not specifically target special needs students.	The SEA contributes $100 per teacher to this initiative.
North Dakota		
State in-service initiative, "Thinking Skills."	The Association for Supervision and Curriculum Development's "Thinking Skills" project is a cooperative initiative the North Central Regional Educational Lab and was first implemented in 1987. The initiative consists of state level training of trainers and local district implementation of the project as deemed appropriate. This initiative does not specifically target special needs students.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
The impetus for this initiative was an effort by the state to redesign the total school system.	The goal of this initiative is to help students use their minds well through active participation.	New Mexico's program was implemented through its participation with six states in the "Schoolhouse to Statehouse" program which began through collaborative efforts of the Coalition of Essential Schools and The Education Commission of the States. The Re: Learning project began in 1988.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	State and regional initiatives were implemented in conjunction with staff development for the new standard course of study. At present, the state and regional education agencies continue to respond to special requests for assistance, though most staff development is now locally administered. Local districts, area schools, and individual staff incorporate select thinking skill goals into their yearly plans.	This initiative does not target the middle grades.
The impetus for this initiative was the need to improve the thinking ability of students.	No information regarding the goal of this initiative was reported.	This initiative is implemented by state through the training of trainers. Local implementation occurs as district deems appropriate.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Ohio		
State curriculum initiative, State Model Competency-Based Education Program (Mathematics).	State Model Competency Based Education Program (Mathematics) serves grades K-12. The program in mathematics includes elements such as problem solving strategies and skills, and persuasive writing and reasoning. Each district implements a program that is developed from the state model. This initiative is a revision of the mandated competency based education of 1983. All students grades K-12 are affected by this initiative. It was implemented during the 1990-91 school year.	No information regarding funding to this initiative was reported.
Ohio		
Pending state curriculum initiative Model Course of Study and Competency Based Education in Language Arts.	The SEA, in response to state legislation, developed a Model Competency Based Curriculum for Language Arts, K-12. In this initiative, the skills of reading, writing, speaking, listening, and viewing are integrated into the regular subject instruction of language arts. This initiative does not specifically target special needs student. It was implemented during the 1990-91 school year.	No information regarding funding to this initiative was reported.
Ohio		
Pending teacher in-service training initiative, Strategies For Success: Classroom Intervention.	Strategies For Success: Classroom Intervention emphasizes alternative teaching/learning classroom strategies. Several of these strategies involve higher level questioning skills. All grade levels and subject areas are targeted by this initiative, however, participation in the program is voluntary. This initiative results from of Ohio's Strategic Plan for the 1990s. The program addresses successful intervention strategies that promote classroom learning in large groups, cooperative learning, and individual teaching techniques. This initiative was implemented in November, 1990.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
The impetus for this initiative was the state's ongoing assessment of mathematics in the classroom.	The goal of this initiative is to incorporate problem solving strategies and persuasive writing and reasoning in mathematics education.	The state competency based education was implemented during the 1990-91 school year by local school districts.	This initiative does not specifically target the middle grades.
The impetus for this initiative was action by the state legislature.	The goal of this initiative is to incorporate thinking skills instruction into regular classroom instruction in language arts.	Competency Based Education in Language Arts will be implemented by those districts that agree to adopt the curriculum.	This initiative does not specifically target the middle grades.
Ohio's Strategic Plan for the 1990s prompted this initiative.	The goal of this initiative is to design a staff development program for implementing a local intervention plan to improve teaching and learning.	The SEA is conducting a teleconference to implement Strategies For Success. After the teleconference, ten regional meetings will be held in Ohio to share the materials and comprehensive staff development program. Video tapes of strategies and printed guidebooks will provide additional direction.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Ohio		
State curriculum/instructional initiative, implementation of National Diffusion Network (NDN) programs that address critical thinking.	The National Diffusion Network (NDN) is a project of the U.S. Department of Education to disseminate exemplary educational programs. The state reported that the programs implemented in Ohio from the National Diffusion Network have emphasized creative or divergent thinking, general learning strategies or skills, persuasive writing and reasoning, and analytical thinking skills. The following programs are part of Ohio's efforts to implement NDN programs: CATS Program (Critical Analysis and Thinking Skills), Philosophy for Children, and IMPACT (Improving Minimal Proficiency by Activating Critical Thinking). This has been an ongoing initiative since 1982. Funding is provided by the U.S. Department of Education. This has facilitated adoption of programs that address areas of identified needs including critical thinking.	The SEA contributes part of the $100,000 funding to this initiative. The amount of the contribution was not reported.
Ohio		
Curriculum initiative for early childhood education.	The Curriculum Guide for Developmentally-Appropriate Early Childhood Education Programs is a decision-making matrix to be used by teachers (Pre-K through third grade) to develop, redesign, or enhance their curriculum. The intent of the Curriculum Guide is to incorporate the teaching and learning of critical thinking through developmentally-appropriate activities.	No information regarding the funding for this initiative was reported.
Ohio		
Curriculum initiative, staff in-service training.	The purpose of the Model for Technology Education in Ohio is to develop general critical thinking strategies and skills, and to teach the workings of technology systems through technological problem solving strategies and interdisciplinary experiences. The model curriculum was implemented in September, 1988. The curriculum is supported through the collaboration of the SEA, university teacher training programs, a network of cooperating school districts, and the professional teachers association.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
Availability of funding provided by the U.S. Department of Education through the National Diffusion Network was the impetus for these initiatives.	The goal of participating in the National Diffusion Network is to increase the opportunities for all schools to access critical thinking programs that work.	The State NDN facilitator disseminates information on programs available through conferences, publications, mailings, telephone contacts, video tapes, etc. to provide awareness of validated critical thinking programs. Based on local interest, in-service training is arranged and follow-up assistance is provided by SEA to insure quality adoptions of selected programs. Training and implementation practices and procedures are closely monitored to insure that key elements of the adopted program are in place and the quality of instruction is maintained.	This initiative does not specifically target the middle grades.
The impetus for this initiative was the recognition that infancy through the primary grades has a distinct developmental continuum that requires qualitatively different thinking and learning. Based on these concerns, the SEA developed the guide.	The goal is to establish developmentally-appropriate early childhood education for all students in Ohio.	The guide was developed in early 1991. Once the guide was developed, a core group of trainers was established. These individuals will then provide training and technical assistance to the teachers and administrators in the local school districts to implement new curriculum.	This initiative does not specifically target the middle grades.
The impetus for Technology Education is the need for all citizens to function effectively in their roles as consumers, voters, workers, employers, and family members.	The goal of Technology Education is to provide individuals with the necessary skills to participate in, and adapt to, a technological society.	Technology education is implemented through staff in-service training and workshops.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Ohio		
Research and demonstration projects developing the creative and critical thinking activities of gifted students.	The initiatives are research and demonstration projects being implemented by two districts that received awards for their proposals from the Ohio Department of Education. One district is implementing its Achieving Cognitive Enhancement (ACE) project; the other is developing Talents Unlimited: An Effective Model for Comprehensive Curriculum Development. The goal is to develop model projects for the service of gifted students. The initiatives focus on regular subject instruction in order to incorporate higher order thinking skills in all content areas.	The SEA contributes $50,000 to this initiative.
Ohio		
Curriculum initiative, Middle School Home Economics Resource Guide.	The Middle School Home Economics Resource Guide was designed to help develop the empowering skills of (1) practical reasoning, (2) interpersonal communication, (3) management, and (4) citizenship. The Resource Guide affects the Consumer Homemaking courses offered in grades 6 through 8. The Resource Guide is designed for use with academically disadvantaged students in economically depressed areas.	No information regarding the funding for this initiative was reported.
Ohio		
State assessment initiative, proficiency testing program for graduation.	Initiative for two-tier proficiency testing for graduation, substitute House Bill #231 passed July, 1987. To earn a high school diploma after July 1, 1993, each student must establish proficiency in reading, writing, mathematics, and citizenship. Learner outcomes appropriate for ninth grade and those appropriate for twelfth grade were adopted by the state and disseminated to all educators in all schools. Districts are responsible for ensuring that students have an opportunity to attain the required competencies prior to taking the test and to provide intervention for those who are not initially successful. Both the ninth-grade and twelfth-grade tests measure critical thinking abilities in reading, writing, mathematics and citizenship. The focus is on application, problem-solving, and analytical reasoning. Reading, mathematics, and citizenship tests have a selected-response format while the writing test involves a constructed-response format.	The SEA contributes approximately $4.5 million to this initiative.

Impetus	Goals	Implement	Middle
The impetus for these projects was a grant program provided by the SEA designed to improve the education of gifted students.	The goal of the initiative was to develop model projects for the service of gifted students.	No information regarding the implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	The Middle School Home Economics Resource Guide was designed to help develop the empowering skills of (1) practical reasoning, (2) interpersonal communication, (3) management, and (4) citizenship.	The Resource Guide will be distributed through statewide in-service training activities.	This initiative specifically targets the middle grades.
The impetus for this initiative was state legislation.	The goal of this initiative is to ensure that graduates have acquired a level of proficiency necessary to continue their education or to enter the work force.	No information regarding the implementation of this initiative was reported.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Oklahoma State in-service training initiative for teachers emphasizing reading/thinking and writing/thinking strategies.	Teacher Training initiative emphasizes reading/thinking and writing/thinking strategies. Metacognition is emphasized for both teacher and students. This initiative serves all students in grades K-12. Nineteen thinking skills are identified and recommended for instruction and integrated into applicable content. They include: establish criteria, verify, summarize, integrate, infer, predict, identify general elements, identify attributes, determine adequacy and accuracy, recognize relationships, represent, compare, classify order, observe, recall, question, define and problem, and set goals. The list of skills is not intended to be a hierarchy or sequence for teaching. It is expected that all skills will be taught at all grade levels. Technical assistance is offered through in-service training in the Tactics for Thinking program and "Skylights: A Handbook for Teaching Thinking Skills". This initiative is integrated throughout the curriculum. It does not specifically target needs students.	The SEA contributes $20,068 to this initiative.
Oregon State curriculum initiative administered through the state's Common Curriculum Goals in Math.	Common Curriculum Goals in Math involves staff development to ensure that all students grades K-12 receive instruction in problem solving. The academic discipline targeted is mathematics, however, the SEA encourages utilization of problem solving techniques in other disciplines. Teacher conferences, trade journals and other materials are available to staff and administrators to provide knowledge and instructional techniques. Special needs students are not specifically targeted by this initiative.	No information regarding funding to this initiative was reported.
Oregon Pending state promotion/assessment initiative, Pilot to Develop Open-Ended Assessment Procedures to Assess Problem Solving.	Pilot to Develop Open-Ended Assessment Procedures to Assess Problem Solving serves students in grades 3, 5, 8, and 11. Eventually, all students K-12 will participate in this initiative. The academic discipline targeted is mathematics. In-service training will be provided so that teachers will be able to analyze students' thinking capabilities to improve teaching performance and effectiveness. This initiative was implemented during the summer, 1990. Special needs students are not specifically targeted in this initiative.	The SEA contributes funding to this initiative. The amount of contribution was not reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	The goal of this initiative is to provide a common base of knowledge and language so teachers can improve instruction in reading and writing with a focus on critical thinking.	The SEA provides the in-service training upon request from local school districts. The teachers involved gradually learn to allow and provide for a classroom climate conducive to question asking and risk-taking. The in-service training emphasizes the teaching of critical thinking skills. The program began in July, 1988.	This initiative does not specifically target the middle grades.
Problem solving in math was initially identified as an emphasis in 1976. When the SEA adopted the Common Curriculum Goals in Math in 1987, it required problem solving strategies to be integrated in mathematics at all grade levels.	The goal of this initiative is to improve students' problem solving abilities, especially in mathematics.	This initiative requires problem solving in mathematics to be incorporated into teaching practices not only through teaching materials and text books, but also as an educational theme for most math conferences, feature articles in math journals, and in-service training. All serve to increase teacher knowledge in the area of problem solving in mathematics.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	The goal of this initiative is to develop an open-ended assessment procedure to assess students' problem solving and thinking ability.	The SEA, the Oregon Math Project, and the Oregon Council of Teachers of Mathematics will aid in the training of teachers, and will solicit volunteer districts to pilot these new procedures.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Oregon		
State in-service training/conference initiative administered by state agencies and teacher organizations.	In-service training conference administered by the SEA and teacher organizations. Teachers receive training in problem solving techniques through local education agencies, the SEA and professional teacher organizations. The initiative targets mathematics, however, the state encourages techniques to be used in other disciplines. Problem solving is addressed as a separate theme and integrated with other themes in math. This initiative does not specifically target special needs students.	The SEA contributes funding to this initiative through the general fund. The amount of contribution was not reported.
Oregon		
Pending state instructional/assessment initiative, Oregon Statewide Assessment Program.	The Oregon Statewide Assessment Program involves instructional reform and specifically targets grades 3, 5, 8, and 11. Areas emphasized include: reading, writing, mathematics, listening, speaking, study, and reasoning for these particular grades. The initiative stresses acquisition of the following skills: descriptive, narrative, persuasive, imaginative, and expository writing; reading comprehension and metacognition; mathematics problem solving and analytic reasoning; evaluative listening and comprehension; inferential reasoning; and evaluation of the influence of mass media. The program is incorporated into regular subject instruction and does not specifically target any special needs students. The assessment instrument was first administered during 1990-91.	The SEA contributes funding to this initiative through its assessment budget. The amount of contribution was not reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	The goal of this initiative is to encourage all education agencies that offer any form of in-service training to include problem solving techniques. This includes groups such as local education agencies, state education agencies and the professional teacher organizations.	Initial implementation occurred in 1976 and continues at workshops and training for teachers at all grade levels.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	The goal of this initiative is through a new assessment measure to provide information for policy decisions by legislators, the state superintendent, governor, and others, and to inform the public about student achievement in Oregon.	Implementation of this initiative began in the 1990-91 school year and all students in the grades 3, 5, 8, and 11 were required to participate in the assessment program. This criterion-referenced assessment will provide students, teachers, administrators, and citizens with reports on student progress and program effectiveness.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Pennsylvania		
State assessment initiative, Broadening of Reading and Mathematics Competency Tests.	Broadening of Reading and Mathematics Competency Tests serves all students in grades 3, 5, and 8. This initiative was first implemented in March, 1990 and targets the academic disciplines of math and reading. This initiative updated tests to incorporate the latest measurement trends and methodologies and assess a broader range of student competencies than previous tests. The reading tests assess reading as a "dynamic process in which the reader interacts with the text to construct meaning." The assessment measures the readers' ability to process that which is: explicit, requiring the student to identify, locate or confirm information directly stated in the passage; implicit, requiring the student to make use of textual information and prior knowledge to construct meaning and draw conclusions; and extended, requiring the student to respond to and think beyond the text. Content of the assessment program has been expanded to include a full range of concepts and skills generally found in the mathematics curriculum. This initiative does not specifically target special needs students.	The SEA contributes funding to this initiative. The amount of contribution was not reported.
Pennsylvania		
State curriculum initiative Analytical Thinking: A Goal of Quality Education.	Analytical Thinking: A Goal of Quality Education is a multi-curriculum initiative encouraging the improvement of communication skills, mathematics, science and technology, citizenship, arts and humanities, analytical thinking, family living, work (personal career awareness and market skills), health, environment, self-esteem, and understanding others. All students grades K-12 are served by this initiative. Each learning objective from the state's twelve Goals of Quality Education must be included in planned courses to be taken by all students at least once in the elementary, once in the junior/middle, and once at the senior levels. The analytical thinking goal is divided into four parts: 1) development of information and management skills, 2) development of logical thinking skills, 3) development of problem-solving skills; and 4) development of decision making skills. This initiative does not specifically target special needs students.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	The goal of this initiative is to broaden tests to stop the trend of basic instruction and move district curricula to include more challenging tasks.	Implementation began in March, 1990 when all students in grades 3, 5, and 8 were tested. Students were then identified for remedial assistance.	This initiative does not specifically target the middle grades.
State statute dictates that "The General Assembly shall provide for the maintenance and support of a thorough and efficient system of public education to serve the needs of the Commonwealth." This provision mandates a quality education for each child and led to this initiative.	The goal of this initiative is to foster achievement of quality education and help every student develop analytical thinking skills.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Pennsylvania		
State initiative, State Survey of Thinking Skills Programs.	State Survey of Thinking Skills Programs is designed to determine/assess the need for state support of local critical thinking initiatives. The survey was sent to school districts in Pennsylvania which were identified by their long range plans and to those requesting survey forms. The thinking skills survey was designed to identify existing programs. The survey included questions pertaining to: the definition of the thinking program, determination of need, research which took place prior to program development, cost factors, level of implementation, length of time program has been in operation, integration and time allotted into school schedule, types of students targeted by program, materials utilized, long range implementation, outside aid, teacher training time, evaluation and assessment of program, number of schools and teachers from each district involved in program, and any previous thinking programs. The survey produced, among others, the following findings. Many school districts which declared analytical thinking as a priority goal in their long range plans have not yet developed a thinking skills program. Most school districts did not consider cost a factor in the selection of a thinking skills program for their district. Thinking skills programs which have been in existence for the longest time were those established for gifted students. The newly established thinking skills programs are often identified as programs for all students but course descriptions indicated they were intended for college-bound students. The approach used by most of the school districts focused on improving questioning skills and was based on Bloom's taxonomy.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
No information was reported regarding the impetus of this initiative.	The goal of the survey was to collect descriptive information about existing and proposed thinking skills programs in Pennsylvania.	The state reports that implementation took place in the summer of 1984.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Pennsylvania		
A state initiative to assess critical thinking programs and a directory that provides description about specific programs and how they are used by students and teachers.	The state reports that the Analytical Thinking Survey and Resource Guide: Program Summaries is a summary of critical thinking programs based on literature reviews and information from the developers of the programs. These programs target a wide variety of disciplines and some are integrated into subject descriptions, while others are not. The following is a list of those programs that appeared in the state survey: Bloom's Taxonomy Program, CoRT (Cognitive Research Trust), Developmental Kindergarten Program, Home Study Skill Program, Instructional Enrichment, Junior Great Books, LOGO, Madeline Hunter Model of Staff Development, MAP, Mastery Learning, Pennsylvania Writing Project, Philosophy for Children, PIP (Professional Improvement Project), Project Light, Project ProCeed-Program(Professionals Committed to Excellence in Education), Structure of the Intellect, Think About, Thinking Curriculum.	No information regarding funding to this initiative was reported.
Puerto Rico		
State curriculum/instructional initiative, Curriculum Revision and Integration.	Curriculum Revision and Integration provides technical assistance to local districts. The process of adopting a revised curriculum and integrating thinking skills for the public schools began in 1986-87. Critical thinking skills are incorporated into the regular (revised) curriculum.	The SEA contributes $325,000 to part of this initiative.
Rhode Island		
State legislative/curriculum initiative, Grade 3 Outcome: Language Arts and Mathematics.	The Grade 3 Outcome: Language Arts and Mathematics initiative is a result of the Rhode Island Literacy and Dropout Prevention Act, 1987. This legislation mandates the following activities: K-3 focus which includes language arts curriculum integrated across content areas (science, social studies, mathematics, health, art, and music); literature beyond the basal reading program; process writing; and accomplishment of grade 3 outcomes. It also includes reduction in class size, and curricula and staff development programs in K-3. State further reports that critical thinking is part of the reading/writing effort. Comprehensive activities include metacognitive strategies and higher order thinking which are incorporated into all subject areas. Critical thinking is not isolated in the language arts curriculum.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
The statutory requirement to support a thorough and efficient public education system was the impetus to improve the teaching of thinking skills.	The goal is to foster achievement of a quality education and should help every student develop analytical thinking skills.	Implementation took place in the summer of 1984 by distribution of the thinking skills survey which was designed to collect descriptive information about existing and proposed thinking skills programs in Pennsylvania.	This initiative does not specifically target the middle grades.
The impetus came from the meeting of the Conference of Spain and Latin American Educators in 1978.	No information regarding the goal of this initiative was reported.	This initiative was implemented through the selection of a teacher and school director from each participating school. These professionals then acted as resource persons for the other teachers in their schools.	This initiative does not specifically target the middle grades.
No information regarding the impetus of this initiative was reported.	The goals of this initiative are to develop fully all students' literacy skills, to prevent failure in early education, and to prevent school dropouts.	The stages of implementation are: (1) June, 1987 - legislation passed, (2) September, 1987 -planning and development, and (3) 1988 - 1991 implementation.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Rhode Island		
State assessment initiative, State Assessment Program.	The State Assessment Program annually assesses critical thinking (higher order skills) in reading (reading comprehension) and in mathematics (problem solving) using the Metropolitan Achievement Test (MAT) at grades 3, 6, 8 and 10. The SEA reports that the MAT also provides a specially constructed "higher order thinking skills" score for students and groups which combines the higher order test items from all content sections of the MAT. In addition, the statewide Writing Assessment Program at grades 3 and 6 is a performance test requiring a complete two-day cycle of pre-writing activities, composing and editing. Writing samples are judged holistically, rather than by discrete basic skills elements. The writing assessment is developed and scored by Rhode Island teachers. Students at grades 3, 6, 8 and 10 must also take health knowledge and physical fitness tests annually. The health tests are comprehensive, but include strong components on substance abuse, nutrition, exercise and AIDS prevention. Physical fitness testing is performance-based and uses norms from the Presidential Physical Fitness Program. The State Assessment Program is mandated statewide and results are used to improve instruction and curriculum and to inform educational policy-making. School districts are offered technical assistance in the interpretation of their local reports.	The SEA contributed $250,000 to this initiative.
Rhode Island		
Rhode Island Local School Reform	The Re: Learning from Schoolhouse to Statehouse initiative is not specifically a critical thinking initiative. The initiative is a total school and instructional reform. School teams redesign the entire school program based on nine essential school principles of the Coalition of Essential Schools at Brown University. Emphasis is on essential skills and knowledge rather than comprehensive "coverage" of curriculum areas. The initiative is targeted on grades 7-12 in seven Rhode Island schools but an elementary and middle school are involved also. The ability to think critically and to develop higher order skills are goals of the essential schools program. These skills and abilities are not treated as separate or discrete learning activities but rather as the central purpose of all education. In addition to Coalition of Essential Schools, the Education Commission of the States is a co-sponsor of this initiative. The Re: Learning initiative calls for a state-level policy group called a Cadre to examine policies and regulations that impede the progress of schools that have joined the Coalition of Essential Schools.	The SEA contributions $150,000 to this initiative (approx. 50% in direct grants to schools; 50% in support services).

Impetus	Goals	Implement	Middle
The impetus of the State Assessment program was a desire to provide a broad information base and guide the development of educational policy and curriculum.	The goal is to provide a broad information base to schools concerning student achievement levels.	The state initiated its current assessment program in 1985-86. Tests are administered under standardized conditions in the local districts and are scored by the state. Score reports are prepared and distributed at the student, classroom, building, district and state levels.	Of four grades annually assessed, two are at the middle school level (grades 6 and 8).
The Commissioner of Education requested that the Governor commit the state to the Re: Learning initiative.	The goal is for all teaching and learning in a school to be guided by the nine essential schools principles. Focus is on students developing lifelong "habits of mind."	The State is committed to support seven Rhode Island Schools over the next five years. The support consists of state funding and professional assistance. The teachers and administrators at the schools participate regularly in Re: Learning seminars and workshops including summer institutes. Each school team also designs and participates in its own Essential Schools inservice training.	The middle grades are included in this initiative, although the focus has been at junior and senior high school grades.

State/Type	Summary	Funding
South Carolina		
State legislative/instructional initiative, Target 2000-Tactics for Thinking.	Target 2000 - School Reform for the Next Decade Act was passed by the South Carolina legislature. The legislation requires the SEA and all school districts to emphasize higher order thinking skills in curricula at all levels. The SEA must assist the local school districts by locating, developing, and advising the districts on the development of materials and other aids which may be used to teach higher order problem solving within existing subjects. The Tactics for Thinking Program produced by the Association for Supervision and Curriculum Development is being implemented by the SEA to conform with the state legislation. This program provides specific help for teachers in integrating critical thinking, creative thinking, and problem solving skills into all areas of the curriculum at all grade levels. Teachers are trained in the instructional strategies of Tactics for Thinking and then train other teachers in the use of the program. Eighty-four percent of students in grades K-12 are served and all academic disciplines are targeted.	No information regarding the funding for this initiative was reported.
South Dakota		
No local or state critical thinking initiative(s) reported.		
Tennessee		
No local or state critical thinking initiative(s) reported.		

Impetus	Goals	Implement	Middle
The impetus is the South Carolina Education Improvement Act of 1984 and the Target 2000 legislation that states the SEA and all school districts shall emphasize higher order problem solving skills in curricula at all levels.	The goal of Target 2000 is for all students to reach their full potential. Teaching higher order thinking skills is one means of achieving this goal.	Implementation occurs as the state provides training for district trainers who will in turn train teachers in their school districts. Over a period of time, all teachers will be trained and thinking skills will be implemented into curricula at all levels.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Texas		
State technical assistance initiative, Realistic Educational Achievement Can Happen (REACH) Program.	This initiative is incorporated into the State Board of Education Long Range Plan 1985-1990 and implemented through the state's Realistic Educational Achievement Can Happen (REACH) Program. The 1985-1990 Long-Range Plan called for the coordination of statewide testing, textbooks, and instructional materials with the state mandated curriculum. Although the state mandated curriculum and (TEAMS) Texas Educational Assessment of Minimum Skills test had begun to incorporate thinking skills in the early 1980s, Realistic Educational Achievement Can Happen (REACH), the state department's technical assistance project, brought a focus on thinking skills into all Texas classrooms. The REACH initiative targeted priority state needs, including critical thinking.	The amount of contribution was not reported.
Texas		
State pilot initiative, technology demonstration pilot sites.	Technology demonstration sites will be established that foster critical thinking at selected pilot schools. The technology demonstration sites are pilot sites that examine the use of technology to establish an active learning environment to promote problem solving to develop creative and divergent thinking skills. Selected pilots will be established in grades 2, 4, 6, 7, and 8.	The SEA contributes $600,000 to this initiative.
Texas		
State curriculum initiative, integrated language arts curriculum.	The integrated language arts curriculum has three essential elements: (1) workshops throughout the state on how to implement an integrated language arts curriculum, (2) publications such as in-service guides that address writing for state-mandated TAAS, (3) TI-IN television network presentation that emphasize critical thinking skills in student assessment program. The TI-IN television network provides educational and instructional programs throughout the state.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
The impetus of this initiative came from the following concerns: (1) the slow recovery of Texas scores, when compared to the rest of the nation on the Scholastic Aptitude Test (SAT); (2) the low scores on the Texas Educational Assessment of Minimum Skills (TEAMS) test taken at alternate grades; (3) the NAEP findings that revealed an absence of higher-level thinking skills among American students, and corresponding findings on the ninth grade TEAMS test, which showed that many Texas districts neglected to teach the objectives requiring higher-level thinking; (4) the statistics which showed that 35% of Texas students who entered ninth grade in 1981, particularly minorities, had dropped out of public school by 1985.	The goal for the Texas initiative is to incorporate critical-thinking and problem-solving skills throughout the curriculum.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Texas		
State assessment initiative, Texas Assessment of Academic Skills (TAAS).	Texas has developed a criterion-referenced test to assess student performance in the areas of mathematics, reading, and writing. Science and social studies will be phased in over the next five years. The Texas Assessment of Academic Skills (TAAS) has been structured to focus on problem solving, reading, comprehension, and life skills. The goal in implementing the TAAS program is to increase the rigor of the state-mandated test by broadening the scope of content eligible for testing and so to encourage school districts to broaden the current curriculum. TAAS was implemented in the fall of 1990.	The SEA contributes $5 per student to this initiative.
Texas		
State curriculum initiative, Essential Elements Revision in Mathematics.	State reports that the mathematics section of the Texas Education Agency is working with curriculum committees from across the state to develop sample curriculum guides. The SEA will distribute these guide to local school districts prior to the time of implementation of new textbooks and revised essential elements. School districts may use them to update and revise their own curriculum guides. The mathematics essential elements revision will affect all grades, K-12. The state textbook directive for mathematics and corresponding revised essential elements calls for problem-solving activities, higher-level thinking skills, the development of problem-solving strategies, and integration of the calculator and computer as problem-solving tools. The revision of essential elements is an on-going process of the Texas Education Agency.	No information regarding funding to this initiative was reported.
Texas		
State in-service initiative, Texas Mathematics Staff Development Program	In 1986, the Texas Education Agency established the Mathematics Staff Development Program, as approved by the State Board of Education. The program is funded under Public Law 98-377, the Education for Economy Security Act (EESA), Title II. It provides funds for the development and implementation of a series of 24 teacher training modules for mathematics teachers of prekindergarten through grade 12. Through a proposal process, contractors across the state are designing staff development modules. The modules are designed to provide a basic foundation for teaching the mathematics essential elements using manipulative materials, concept development techniques, and problem-solving applications. The modules promote critical thinking skills, analytical reasoning, and creative thinking.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
The impetus for TAAS is to increase the rigor of the state-mandated tests by broadening the scope of content for testing procedure.	The goal of TAAS is to initiate more comprehensive teaching with in the schools.	The TAAS assessment measure was implemented in the fall of 1990 by testing all students in grades 3, 5, 7, 9, and 11 (except those students in special education).	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
The impetus for this initiative was state legislation.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Texas		
State legislative/curriculum initiative: teaching science through the scientific method K-12.	Texas science curriculum has been restructured as a result of H.B. 246, which mandated science essential elements by grade and course. The science essential elements mandate the teaching of the scientific method. Restructured science curriculum includes lessons focused on identifying a problem, stating a hypothesis, predicting outcomes, designing an experiment, and communicating conclusions. Science is a requirement for all students grades K-10.	The SEA contributes $130,000 to this initiative.
Texas		
State curriculum initiative, Curriculum Guides in Mathematics.	State reported that the mathematics section of the Texas Education Agency is working with curriculum committees from across the state to develop sample Curriculum Guides in Mathematics. The SEA will distribute these guidelines to local school districts prior to the time of implementation of new textbooks and revised essential elements. School districts may use them to update and revise their own curriculum guides. It is hoped that these guides will ultimately influence teaching by introducing more concept development, problem solving, and technology integrated throughout the mathematics curriculum.	No information regarding funding to this initiative was reported.
Utah		
State curriculum initiative, Utah State Office of Education Core Curriculum Standards.	Utah State Office of Education Core Curriculum Standards were established in 1984 and must be completed by all students K-12 as a requisite for graduation from Utah's secondary schools. Many of these standards contain critical thinking skills. The academic disciplines involved in this initiative are: language arts, math, science, social studies, the arts, healthy lifestyle, information technology, and vocational education. The program is integrated into regular subject instruction.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
The impetus for this initiative are the new state-mandated essential elements.	No information regarding the goal of this initiative was reported.	State reports that restructured science education will be implemented through the mandated state-wide curriculum.	This initiative does not specifically target the middle grades.
The impetus for the Mathematics Curriculum Guides was the state revision of mathematics essential elements.	The goals of the Mathematics Curriculum Guides are to insure that students will be able to (1) estimate solutions, (2) analyze problems and identify solution strategies, (3) express problems using mathematical representations, and (4) evaluate the reasonableness of problem solutions. It is hoped that these guides will ultimately help to influence teaching by introducing more concept development, problem solving, and technology integrated throughout the curriculum.	State reported that the mathematics section of the Texas Education Agency is working with curriculum committees from across the state to develop sample Curriculum Guides in Mathematics. The SEA will distribute these guide to local school districts.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	Critical thinking standards were developed in cooperation between local educators and SEA staff. Criterion reference test items were developed in this same manner. LEAs implement the standards with training and assistance from the SEA.	This initiative does not specifically target the middle schools.

State/Type	Summary	Funding
Utah		
Core curriculum standards and two local instructional initiatives: (1) Empowering Students with Processes to Think Critically and Become Self-Directed Learners, and (2) Planning How to Implement Creative, Critical and Problem Solving Thinking Skills in Academic Classes.	State reports that core curriculum standards must be completed by all students K-12 and that many standards contain critical thinking skills. Standards were implemented in 1984. State also reports two local instructional initiatives: Empowering Students with Processes to Think Critically and Become Self-Directed Learners, and Planning How to Implement Creative, Critical and Problem Solving Thinking Skills in Academic classes grades 9-12.	No information regarding funding to this initiative was reported.
Vermont		
State assessment initiative which includes the use of critical thinking skills for evaluating mathematics and writing portfolio pieces.	Assessment of Critical Thinking makes use of critical thinking skills for part of mathematics assessment and writing portfolio. This initative will assess student achievement of 4th and 11th graders in writing and mathematics using three methods: a uniform test, a portfolio, and a "best piece." This approach combines newer assessment methods with more traditional means. Vermont will train its teachers in the use of portfolios and other authentic measures to assess student achievement. The criteria for evaluating mathematics and writing portfolio pieces includes the use of critical thinking skills.	No information regarding funding to this initiative was reported.
Virgin Islands		
No thinking initiatives were reported.		
Virginia		
State science education survey, Science Education Program Assessment Model.	The Science Education Program Assessment Model (SEPAM) consists of survey instruments given to school administrators, teachers, students, and parents. The survey instrument measures the learning environment and fixed facilities of a school for their contribution to science education. The SEA will help conduct the survey upon request by a local school division. A team of observers will be assembled to conduct the classroom observations and facility review. The results of the survey will help schools assess their science programs in order to determine how well they support a thinking-based, hands-on science curriculum.	No information regarding funding to this initiative was reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding the implementation of this initiative was reported.	One local initiative specifically targets the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	The goal of the Science Education Program Assessment Model (SEPAM) is to provide school divisions with information which they can use to target resources to improve the quality of thinking-based science instruction.	The SEA will help conduct the survey upon request by a local school division. A team of observers will be assembled to conduct the classroom observations and facility review.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Virginia		
Collaboration between general education and vocational education.	State reported that the initiative, Extending Collaboration between General Education and Vocational Education, involves the support of in-service training and planning sessions for the SEA staff professionals. State reported extensive collaboration with the Southern Regional Education Board (SREB) in some school divisions and at the state level. Efforts are to include the incorporation of critical thinking skills into regular subject instruction.	No information regarding funding to this initiative was reported.
Virginia		
Task force initiative, the Thinking Skills Task Force.	The Thinking Skills Task Force developed an inventory of thinking skills for use in local school divisions and helped SEA staff members plan a statewide thinking skills conference. The twenty-four member task force is comprised of: superintendents, directors of instruction, principals and other educators from across Virginia to provide in-service training, materials, and leadership in potentially every grade and discipline.	The SEA contributes to this initiative. The amount of contribution was not reported.
Virginia		
Teacher education restructuring initiative.	State reported that an undergraduate degree in arts and sciences will be required for all teachers educated in Virginia, effective July 1, 1992. This recommendation was the result of the Governor's Commission on Excellence in Education Report (1986). The Report stated that "to bring about a real change in the way teachers are prepared in college, the undergraduate degree in teacher education should be abolished." The Report stated that the four-year curriculum for students preparing to teach should consist of the greatest number of courses in the arts and sciences which can be included and some specially developed education courses.	No information regarding funding to this initiative was reported.
Virginia		
Curriculum initiative, Language Across the Curriculum.	The Language Across the Curriculum project consists of workshops and publications incorporating reading, writing, listening and speaking across the curriculum. All subject area staff including vocational education were invited to take part in the Language Across the Curriculum project.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	No information regarding the implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	Implementation took place as the Thinking Skills Task Force developed an inventory of thinking skills for use in local school divisions and helped the Department of Education staff members plan a state-wide thinking skills conference.	This initiative does not specifically target the middle grades.
The impetus for the restructuring of teacher education in Virginia was the Governor's Commission on Excellence in Education Report (1986).	The goal of the teacher restructuring recommendation is to bring about a real change in the way teachers are prepared in college. The goal of restructuring is to make Virginia's school system among the nation's best by making teacher education academically challenging. Requiring a B.A. or B.S degree will provide teacher with a thorough grounding in the liberal arts and sciences and in the subjects they teach.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
This initiative was a grassroots effort supported by colleges, universities, professional organizations, and the SEA.	The goals of the Language Across the Curriculum Project are to increase careful and thoughtful (reflective) thinking and writing in all disciplines of the K-12 curriculum.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Virginia		
State conference on critical thinking, Thinking and Education: Curriculum, Instruction, Assessment.	Thinking and Education: Curriculum, Instruction, Assessment—A Statewide Conference was an interdisciplinary conference drawing teachers and administrators from over 45 school divisions, 7 Virginia colleges and universities, several private schools, and the U.S. Department of Education. Attendance exceeded 600 educators. Fifty-one different workshop leaders provided 41 separate workshops. The conference was held in September, 1987.	No information regarding the funding for this initiative was reported.
Virginia		
State assessment initiative, Sixth-Grade Literacy Tests.	Sixth-Grade Literacy Tests are the result of Virginia's State Learning Objectives which are designed to move students beyond recall by including writing samples and a focus on reading comprehension rather than on separate and discrete skills. Tests were begun in 1988 and assess literacy in English, language arts/reading, and mathematics. Passing the test in grades 6, 7 or 8 will be required for promotion to grade 9.	No information regarding funding to this initiative was reported.
Virginia		
State initiative to revise Standards of Learning Objectives	In 1988, Virginia's Standards of Learning Objectives for all general education subject areas, K-12, were revised to include assessment procedures designed to move students beyond recall and into higher cognitive operations.	The SEA contributes funding to this initiative. The amount of contribution was not reported.
Washington		
State school restructuring grant program, Schools for the 21st Century.	The Schools for the 21st Century initiative, although not strictly an initiative in critical thinking, is a grant program from the State Department of Public Instruction that gives substantial financial resources to schools that participate in restructuring. Many of these schools have focused on curriculum development that has affected the teaching of critical thinking. In May, 1987 the Washington Legislature authorized the Schools for the 21st Century program. From 134 original proposals, the Governor's Task Force recommended approval of 21 projects to the State Board of Education. The successful projects include one elementary school, one middle school, five high schools, four districts, and two special configurations.	No information regarding the funding for this initiative was reported.

Impetus	Goals	Implement	Middle
No information regarding the impetus for this initiative was reported.	No information regarding the goal of this initiative was reported.	This initiative was implemented by an interdisciplinary conference.	This initiative does not specifically target the middle grades.
The impetus for sixth grade reading tests was the Governor's Commission on Excellence in Education. The Commission recommended that Virginia schools establish literacy tests in reading, writing and mathematics by July 1, 1987, for all students in grade 6, and award a literacy passport to those who pass.	The goal of the 6th grade testing is to prepare students for a more demanding level of secondary education.	State reported that implementation occurs as tests are given to students and then remedial action will be taken if necessary.	This initiative does not specifically target the middle grades.
Virginia's learning objectives were developed in 1988 at the direction of the State Superintendent of Public Instruction.	The goal is to move students beyond recall into higher cognitive operations.	Virginia has provided week-long summer institutes for K-12 teachers at universities across the state since development of the SOL objectives.	This initiative does not specifically target the middle grades.
The impetus for the Schools for the 21st Century Project is the Washington state law authorizing the program.	The purpose of the program is to determine whether increasing local decision-making authority will produce more effective learning.	Implementation of the 21st Century Schools Program relies on individual schools applying for state funds and exceptions to regulations in order to restructure. The 296 school districts are autonomous and may restructure according to their plans, provided they are accepted by the Governor's Task Force.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Washington		
Statewide conference, Higher Order Thinking Skills Conference.	Washington promotes critical thinking through its statewide conferences on critical thinking "Thinking About Thinking" and "Thinking About Thinking: Second Thoughts". District teams were brought together at these conferences to consider the latest research and practices in teaching critical thinking skills. All program supervisors in the subject areas (language arts, reading, science, arts, mathematics, social studies, health, and physical education) were involved in the planning and follow-up of these statewide meetings. These conferences have brought together K-12 classroom teachers, principals, administrators, parents and the business community to promote the teaching of critical thinking in Washington's public schools.	The SEA contributes to this initiative. The amount of contribution was not reported.
West Virginia		
State instructional initiative, The West Virginia Challenge.	The West Virginia Challenge integrates problem-solving, scientific reasoning and cooperative learning into the basic content areas of math, language arts, and social studies. The initiative includes four components: Academic Challenge, Thinkers' League, Choose the Challenge, and Target Challenge. The West Virginia Challenge is training individuals at the school, county, Regional Education Service Area, state and community levels in the thinking game strategies that are used to implement these skills. The initiative is integrated into the classroom curriculum.	The SEA contributes $100,000 to this initiative.

Impetus	Goals	Implement	Middle
The impetus for the conference was to give teachers in Washington an introduction and exposure to the rapidly growing literature pertinent to thinking skills instruction.	The goal of the conferences "Thinking About Thinking" were to promote the teaching of critical thinking skills in Washington classrooms.	Districts that wanted to attend the conference sent a district team composed of teachers, administrators, parents, and community representatives.	This initiative does not specifically target the middle grades.
The impetus for the initiative began three years ago as a program titled Academic Games. The program was assessed by the state coordinator as useful for gifted education. Based on early success, the State Superintendent of Schools, the Governor, and key legislators promoted the program for all students.	The goal of the West Virginia Challenge is to improve the critical thinking skills for all students.	The West Virginia Challenge will be implemented through four major components: (1) The Academic Challenge: Problem-Solving Techniques, (2) The Thinkers League: Computer Problem-Solving, (3) Statewide Community Training, and (4) Target Challenge: Pilot School Project. Pre, post and continuing research data will be collected to determine changes in academic achievements and behaviors effecting this initiative.	This initiative does not specifically target the middle grades.

State/Type	Summary	Funding
Wisconsin		
Curriculum initiatives, "Exploring Life and Work: A Conceptual Approach for Middle School," and "Strategic Learning in the Content Areas."	Wisconsin reports the development of a curriculum guide for middle-level vocational education entitled, "Exploring Life and Work: A Conceptual Approach for the Middle School." The guide encourages exploration of what productive people do and how they think; it presents vocational education as a study for work and life, requiring the development of thinking skills. The guide will target the middle grades (6-9) in vocational education. The curriculum guide seeks to develop general thinking skills including: exploratory course work, concept learning, cooperative learning, and multi-disciplinary activities. A second curriculum guide was published for all content areas and grade levels, "Strategic Learning in the Content Areas." The goal of this guide is to improve students' reading and writing beyond the elementary grades and to promote writing across the curriculum. The guide includes: art education, foreign language, health education, literature, mathematics, music education, physical education, science, social studies, and vocational education.	No information regarding the funding for this initiative was reported.
Wisconsin		
State licensure initiative, Wisconsin Administrative Code.	Wisconsin Administrative Code: PI4.09 mandates that professional education programs leading to licensure will require study and experience specifically designed to develop the competencies needed to teach critical thinking.	No information regarding funding to this initiative was not reported.
Wyoming		
State Accreditation Program.	New standards for school accreditation include problem solving and critical thinking as two of six elements in the Common Core of Skills. All schools must develop student performance standards in each area of the Common Core and by 1994 report progress toward meeting the performance standards to their communities.	No special funding is set aside specifically for the critical thinking and problem solving portion of the accreditation standards. Funding requests to the 1991 legislative session, however, cite the new standards as one of the reasons for additional funding. In addition, the SEA has placed technical assistance to districts as a high priority for its use of state or federal discretionary funds.

Impetus	Goals	Implement	Middle
The impetus for the vocational education curriculum guide was the "Instrument to Assess the Status of Middle Level Grades in Wisconsin's Public Schools" conducted in October, 1989.	The goal of the middle school vocational education, critical thinking initiative is to create global understanding, integrate critical thinking, promote outcome-based education, provide preparation for employment and include wise use of technology. The goal of the strategic learning guide is to increase reading and writing sophistication beyond the elementary grades and to incorporate these skills into content areas.	The middle level vocational education critical thinking initiative will be implemented over 4 years. During 1990 the vocational education curriculum guide for middle level schools was be published; in 1991 the pilot programs, training, and re-training of teachers began; in 1992 new learning activities will be published; in 1993 the program will be refined and full implementations will be promoted.	This initiative specifically targets the middle grades.
No information regarding the impetus for this initiative was reported.	The goal of this initiative is to provide teachers trained in Wisconsin with the competencies to teach critical thinking skills.	No information regarding implementation of this initiative was reported.	This initiative does not specifically target the middle grades.
The impetus for this initiative was a two year study by a State Board/SEA task force.	The goal of this initiative is to better prepare Wyoming youth for the 21st Century.	The accreditation system will be fully implemented by September, 1994.	This initiative does not specifically target the middle grades.

STATE CRITICAL THINKING INITIATIVES: TARGETED FOR STUDENTS WITH SPECIAL NEEDS

State/Type	Summary	Classification
Alabama		
State assessment and professional development initiative, Jefferson County Talent identification Program-Talents Search which serves gifted young women in the area of mathematics.	Jefferson County Talent Identification-Talent Search serves gifted girls in grades 5 through 7 from rural Jefferson County. This program provides professional development opportunities for teachers emphasizing improved instruction, teaching at critical thinking skills, and integration of these skills in the mathematics curriculum. The initiative also involves an assessment of the effects of the professional development activities on the SAT/ACT scores of participating girls.	Talent Search serves gifted girls in rural Jefferson County, grades 5-7.
Alaska		
State staff development initiative, Alaskan Staff Development Network.	Alaskan Staff Development Network is designed to assist teachers and administrators in helping at-risk students improve their academic achievement. The network is coordinated by the Coalition For Alaskan At-Risk Youth, a statewide partnership designed to assist teachers and administrators in helping at-risk students overcome barriers to high performance. State reported no percentage or number of students served, academic disciplines involved, or whether the initiative was incorporated in or separate from regular subject instruction.	At-risk students.
Colorado		
State instructional initiative, Chapter I Whole Language Reading Project.	The Chapter I Whole Language Reading Project (WLRP)is based upon a comprehensive assessment of individual students' needs and interests where the teacher develops an individualized educational plan for each student. The project goal is to provide supplemental instruction that will assist participating students to succeed as readers, writers, and thinkers in their regular classroom with a patter of sustained growth. Fifty-three Chapter I programs are implementing Whole Language Reading Projects serving approximately 17,900 students in grades K-12.	Chapter 1 students grades K-12.

Funding	Impetus	Goals	Implement
The SEA contributes through the Duke University Talent Program and Jefferson County for this initiative. The amount of contribution was not reported.	The impetus was to identify rural gifted girls in the fifth grade and to focus on higher cognitive skills in the area of mathematics.	The goals are to focus on higher cognitive skills in the area of mathematics and to assess the effect upon SAT/ACT scores of females at the end of a three year period.	No information regarding the implementation of this initiative was reported.
The SEA funds 5% of the Alaskan staff development network's programs and consortium members and other external funding sources support the balance.	The Alaskan Staff Development Network program, Coalition for Alaskan At-Risk Youth, was initiated in April 1983 in order to implement recommendation developed by former Governor Jay Hammond's School Effectiveness Task Force.	The goal is to assist teachers and administrators in helping at-risk students overcome barriers to high performance.	No information regarding the implementation of this initiative was reported.
No information regarding the funding for this initiative was reported.	No information regarding the impetus for this initiative was reported.	The goal is to provide supplemental instruction that will assist participating students to succeed as readers, writers, and thinkers in their regular classrooms with a pattern of sustained growth.	No information regarding the implementation of this initiative was reported.

State/Type	Summary	Classification
Iowa		
State curriculum initiative, Reading Comprehension Strategies.	The Reading Comprehension Strategies program involves SEA-sponsored workshops designed to enhance the abilities of Chapter I reading teachers to teach comprehension skills/strategies to their students. The academic discipline involved is reading and the critical thinking skills are taught separately in the regular Chapter I reading instruction classes. All Chapter I students, grades K-12, are served and Chapter I teachers are targeted by this initiative.	All Chapter I students grades K-12 are targeted.
Maine		
State curriculum/instructional initiative, HOTS (Higher Order Thinking Skills)	HOTS (Higher Order Thinking Skills) involves schools in 10 LEAs and serves Chapter I students in grades 3-7. HOTS targets all disciplines and attempts to help develop the fundamental thinking skills that underlie all learning and problem solving through computer use and specialized instruction. The program is separate from regular instruction and its goal is to improve the level of achievement for Chapter I students so that they no longer need remedial services.	Chapter I students are served in the 10 designated school systems.
Maryland		
State instructional initiative, Learning to Think/Thinking to Learn is an instructional program for special needs students.	Learning to Think/Thinking to Learn is a program designed to provide at-risk learners with a targeted program of direct instruction in thinking skills and cognitive learning strategies. The students targeted are those who are Chapter 1 eligible and in grades 2-6. The program is incorporated into regular subject instruction in reading/language arts, mathematics, social studies, and science. An identified set of thinking skills, concomitant graphic organizer, and metacognitive strategies are explicitly taught and applied to the various content areas.	Students identified for participation in Chapter 1 programs in grades 2-6 are targeted.

Funding	Impetus	Goals	Implement
The SEA contributes through Chapter I Administrative funding to this initiative. The amount of contribution was not reported.	State reported that the impetus for this initiative was the requirement that Chapter I programs must be evaluated in basic and advanced skills.	No information about the goals of this initiative was reported.	State reports that Reading Comprehension Strategies are taught in the Regular Chapter I reading instruction classes.
No information regarding the funding for this initiative was reported.	No information regarding the impetus for this initiative was reported.	The goal of this project is to improve the level of achievement for Chapter I students so that they no longer need remedial services.	HOTS is a pull-out program which is designed to enhance social interaction and basic skills and is separate from classroom instruction.
No information regarding the funding for this initiative was reported.	The Learning to Think/Thinking to Learn was a result of students identified as at risk of school failure being placed into remedial programs, which frequently consist of "skill drills" on low-level, minimum competency materials. Such a reductional instructional approach does not stimulate thinking and rarely results in true remediation.	No information regarding the goals of this initiative was reported.	The program is incorporated into regular subject instruction in reading/language arts, mathematics, social studies, and science.

State/Type	Summary	Classification
Nevada		
State instructional initiative, Talents Unlimited.	Talents Unlimited, trains teams of teachers to teach critical thinking skills in remedial programs. Academic disciplines targeted by this program for special needs students are reading, mathematics, and language arts. The program is incorporated into class instruction to provide a higher level of thinking and problem solving for participating students.	All special needs students grades K-6 are served by this initiative. Students eligible for Chapter I services (low income attendance areas and low academic achievement) or students in institutions for the neglected and delinquent.
Nevada		
State instructional/middle level initiative, Impact.	Impact trains teachers to teach critical thinking skills in remedial programs. The program serves students in grades 7-9 who are eligible for Chapter I services or those in institutions for the neglected and delinquent. Academic disciplines targeted by this program for special needs students are reading, mathematics, and language arts. The program is incorporated into class instruction and state hopes to provide a higher level of thinking and problem solving for participating students.	Students eligible for Chapter I services (low income attendance areas and low academic achievement) or students in institutions for the neglected and delinquent.
Nevada		
State curriculum/instructional initiative, HOTS (Higher Order Thinking Skills).	HOTS (Higher Order Thinking Skills) provides in-service training for teachers to assist Chapter I students in developing thinking skills. The program serves students in grades 4-8 who are eligible for Chapter I services or those in institutions for the neglected and delinquent. The HOTS program focuses on general critical thinking strategies and skills, encouraging the development of analytical reasoning and problem solving skills using computers. The program is incorporated into all remedial class instruction to provide a higher level of thinking and problem solving for participating students.	Students eligible for Chapter I services (low income attendance areas and low academic achievement) or students in institutions for the neglected and delinquent.

Funding	Impetus	Goals	Implement
Funding for this initiative comes from the National Diffusion Network funding to this initiative. The amount of contribution was not reported.	The impetus comes from new federal laws and regulations for Chapter I programs requiring training in advanced skills as well as basic ones. There is also a general trend in education toward training all students in higher level thinking and problem solving.	The goals of the initiative are to train school teams of teachers and administrators to teach critical thinking skills in remedial programs, to inform Chapter I administrators and others of thinking skills issues and model programs, and to provide them with resources and materials to train teachers.	No information regarding the implementation of this initiative was reported.
No information regarding the funding for this initiative was reported.	The impetus comes from new federal laws and regulations for Chapter I programs which requires training in advanced skills as well as basic ones. There is also a general trend in education toward training all students in higher level thinking and problem solving.	The goals are to train school teams of teachers and administrators to teach critical thinking skills in remedial programs, to inform Chapter I administrators and others of thinking skills issues, and model programs, and to provide them with resources and materials to train teachers.	No information regarding the implementation for this initiative was reported.
No information regarding the funding for this initiative was reported.	The impetus comes from new federal laws and regulations for Chapter I programs which requires training in advanced skills as well as basic ones. There is also a general trend in education toward training all students in higher level thinking and problem solving.	The goals are to train school teams of teachers and administrators to teach critical thinking skills in remedial programs, to inform Chapter I administrators and others of thinking skills issues and model programs, and provide them with resources and materials to train teachers.	No information regarding the implementation of this initiative was reported.

State/Type	Summary	Classification
Nevada		
State instructional initiative, Teaching Strategies for Thinking.	Teaching Strategies for Thinking, trains teams of teachers to teach critical thinking skills in remedial programs. The program serves students in grades K-6 who are eligible for Chapter I services or those in institutions for the neglected and delinquent. Academic disciplines targeted by this program for special needs students are reading, mathematics, and language arts. The program is incorporated into class instruction to provide a higher level of thinking and problem solving for participating students.	Students eligible for Chapter I services (low income attendance areas and low academic achievement) or students in institutions for the neglected and delinquent.
New Jersey		
New Jersey instructional initiative, Basis Skills Improvement Program (BSIP).	The Basic Skills Improvement Program is a set of workshops by the SEA for LEAs on how to increase academic achievement levels for students who are not acquiring their grade-level skills, or who are unable to pass the state's High School Proficiency Test (HSPT) needed for graduation. The disciplines targeted are reading, writing and mathematics.	Chapter I and state compensatory education pupils grades K-12.
New Mexico		
State instructional/curriculum initiative, HOTS-Higher Order Thinking Skills.	The Higher Order Thinking Skills initiative serves Chapter I students in grades 3-6, who scored under the 49th percentile. Instruction focuses on teacher ability to provide problem-solving and linkage activities. Also, additional computer software is provided as a tool to improve the learning of at-risk students while enhancing the environment so that students may test and discuss new ideas.	Chapter I students, scoring under 49th percentile are served by this.

Funding	Impetus	Goals	Implement
No information regarding the funding for this initiative was reported.	The impetus comes from new federal laws and regulations for Chapter I programs which require training in advanced skills as well as basic ones. There is also a general trend in education toward training all students in higher level thinking and problem solving.	The goals are to train school teams of teachers and administrators to teach critical thinking skills in remedial programs and to inform Chapter I administrators and others of thinking skills issues and model programs, and to provide them with resources and materials to train teachers.	No information regarding the implementation of this initiative was reported.
The SEA contributed $415,000 to this initiative for 1990-91.	The Basic Skills Improvement Program was implemented in 1988 with passage of the federal Elementary and Secondary Education Improvement Act. The part of the program aimed at helping students pass the HSPT was implemented when the test became a requirement for high school graduation.	The goal of the program is to bring students up to grade-level achievement standards so they can pass the HSPT when they reach the 9th grade or before they graduate if the student is past this grade.	No information regarding the implemenation of this initiative was reported.
The SEA contributes funding through Chapter I. The amount of contribution was not reported.	No information regarding the impetus for this initiative was reported.	The goal is to use higher-order thinking activities to improve basic skills and social confidence, while also improving problem solving ability.	No information regarding the implementation of this initiative was reported.

State/Type	Summary	Classification
New Mexico		
State curriculum, instructional initiative, Mediated Learning.	The Mediated Learning initiative focuses on teacher interaction with special needs students, grades K-6. Chapter I, Special Education, Average and Gifted are served in the Renasco school district. The instructional elements of Mediated Learning focus on the teacher as he/she becomes a mediator of learning. These elements include: Intention to produce structured change, Transcendence of immediate learning, Demonstration of how the learning experience has meaning and purpose, Self Regulation of the child's behavior by his response. The instructor not only uses lesson plan development but demonstrations as well. A separate curriculum to mediate higher order thinking skills and elicitation of these skills in content areas provides new experiences (non-traditional content) where the child can demonstrate that s/he has mastered the learning principle and strategy. This initiative does not specifically focus on the middle grades.	Chapter I, Special Education, Average and Gifted students are served by this initiative.
New York		
The SEA Office for School Improvement Grants Management and Compliance has developed a project known as Congruence to ensure the reality that special needs students have access to equitable program opportunities across curriculum areas. These opportunities include exposure to higher order learning.	Re-authorized Chapter I legislation and the attendant statement of purpose claim that to succeed in the regular program; schools provide for frequent and regular coordination between the compensatory education program and developmental programs; and that students demonstrate achievement gains in both basic and more advanced studies. While New York did not report a specific critical thinking initiative targeting special needs students the state did report on an initiative which resulted in educationally disadvantaged students having access to equitable program opportunities across curriculum areas. While the Office for School Improvement Grants Management and Compliance has no project which focuses on "critical thinking skills" per se; where those projects operate, special needs students are included. Congruence projects operate within and across the various subject areas to include as primary focus reading, mathematics, and writing (using bilingual methodology) and ESL. Educationally disadvantaged students in grades K-12 are served by this initiative.	Low achieving or educationally disadvantaged students.

Funding	Impetus	Goals	Implement
The SEA contributes funding through Title VII, Bilingual Education and Chapter II. The amount of contribution was not reported.	No information regarding the impetus for this initiative was reported.	The goals of this initiative are to promote interactive thinking, to elicit higher order thinking skills, to develop teacher questioning techniques.	No information regarding the implementation of this initiative was reported.
No information regarding the funding for this initiative was reported.	This initiative resulted from the 1988 Hawkins/Stafford Elementary and Secondary School Improvement Amendments.	State reports that the goal is to ensure the reality of the right that all special needs students have access to equitable program opportunities across curriculum areas.	No information regarding the implementation of this initiative was reported.

State/Type	Summary	Classification
Pennsylvania		
State instructional and staff development initiative, Pennsylvania Migrant Education Program.	The Pennsylvania Migrant Education Program offers teacher training and follow-up in critical thinking skills. The program serves special needs students in grades K-12 who are children of migratory farmworkers. The instructional approach used is the Tactics for Thinking program. This program makes it possible to track and monitor the child's education while providing supplemental academic and support services for children and their families. The goals of the PA Migrant Education Program are the reduction of the drop-out rate, increased graduation numbers and increased literacy among migrant children. The state reports that 70% of students who are children of migrant farmworkers are limited English proficient.	All special needs migrant students grades K-12 are served by this initiative.
Pennsylvania		
State instructional/assessment initiative, Mediated Learning Experience (MLE).	Mediated Learning Experience (MLE) focuses on developing cognitive skills. The assessment component is called Learning Potential Assessment Devices. Special needs students ages 10 and older within 9 of the 28 districts are served. The academic disciplines targeted are often those related to communications skills classes but this program is applicable to all curriculum areas. Separate from regular classroom instruction, this program is designed to improve students' cognitive skills by using Feuerstein's Instrumental Enrichment approach.	State reports populations being served are located in 9 of 28 designating school districts with 230 of those teachers participating in MLE during 1989-90.
Puerto Rico		
Two state, instructional/middle level initiatives—Instrumental Enrichment and Project Impact.	Instrumental Enrichment and Project Impact are aimed at improving students thinking skills. Both Instrumental Enrichment and Project Impact serve 540 students in the 7th through 9th grades who are considered to be Chapter I special needs students. The programs are self-contained and use the programs designed by Feuerstein. These initiatives are orientated to enhance the learning and reduce the instructional lag these students face. The middle grades are targeted by this initiative.	Chapter I students.

Funding	Impetus	Goals	Implement
The SEA contributes to this initiative. The amount of contribution was not reported.	The impetus for this initiative is a result of movement by migratory farmworker and their children from one state and school district to the next, and the difficulty faced by schools to address the migrant child's individual needs in the limited time are enrolled. This limited access results in a fragmented, incomplete education for the 4000 migrant children temporarily residing in PA each year.	The goals of the PA Migrant Education Program are the reduction of the drop-out rate, increased graduation and increased literacy among migrant children.	Components of the initiative are integrated into classroom instruction, while others remain separated from school format.
The SEA contributes funding to this initiative. The amount of contribution was not reported.	No information regarding the impetus for this initiative was reported.	The goal of this program is to assist students improve their thinking skills.	Mediated Learning Experience is separate form regular classroom instruction.
The SEA contributes funding to this initiative. The amount of contribution was not reported.	No information regarding the impetus for this initiative was reported.	State reports projects are still in the experimental phase. The goal of the project is to enhance learning by students participating in Chapter I.	Projects are self contained and each have their own process content and valuative materials.

State/Type	Summary	Classification
South Carolina		
State curriculum/instructional initiative, HOTS (Higher Order Thinking Skills) targeting Chapter I students.	HOTS (Higher Order Thinking Skills) serves Chapter I students in grades 4 and 5. The disciplines targeted for these special needs students fall under the reading/language arts curriculum. The program is designed to meet individual needs and the goal is to combine an instructional approach in association with general concepts and skill taught in the HOTS lab. This program is integrated into regular classroom instruction.	The program serves Chapter I students.
Texas		
State technical initiative Institute for Higher Level Thinking for Migrant Teachers.	Institute for Higher Level Thinking for Migrant Teachers focuses on staff development for migrant teachers in order to increase the use of thinking skills in classrooms serving migrant students. Institute participants learn strategies to: (1) facilitate the teaching of higher level thinking skills in migrant classrooms, (2) develop practices that will create classroom climates that will encourage higher level thinking for migrant students, and (3) develop a final document with higher level thinking skills for migrant teachers. The institute focuses on training in the thinking skill areas outlined in the Tactics program of the Association for Supervision and Curriculum Development. The initiative incorporates thinking skills into the curriculum.	Migrant students
Wisconsin		
Local/curriculum middle school initiative Caring, Daring, and Sharing: A Middle Grade Initiative.	Caring, Daring, and Sharing is an effort in two Wisconsin urban middle schools that incorporates into the school curriculum: accelerated learning methods, cooperative learning techniques, programming for differences in student learning styles, and emphasis on critical and creative thinking. The program serves disadvantaged students in grades 6-8 and the disciplines targeted are language and history.	All special needs students in both participating school districts grades 6-8.

Funding	Impetus	Goals	Implement
Separate program for Chapter I students focusing on reading/language arts.	The impetus of the project was to provide an extension of basic skills instruction in a specialized framework designed to meet individual needs.	The goal of the combined instructional approach is to develop associations between general concepts and specific skills taught in the classroom and the concepts and skill taught in the HOTS lab.	No information on the implementation of this initiative was reported.
The SEA contributed $100,000 through Chapter 1 Migrant funds for this initiative.	No information regarding the impetus for this initiative was reported.	The goals of the Institute for Higher Level Thinking are to give participants strategies to: (1) facilitate the teaching of higher level thinking skills in migrant classrooms, (2) develop practices that will create classroom climates that will encourage higher level thinking for migrant students, and (3) develop a final document with higher level thinking skills for migrant teachers.	No information regarding the implementation of this initiative was reported.
No information regarding the funding for this initiative was reported.	No information regarding the impetus for this initiative was reported.	No information regarding the goal for this initiative was reported.	No information regarding the implementation of this initiative was reported.

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